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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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74-1267. Harmer, R. (Author address not given). **Merchants of death.** *Environ. Qual. Mag. 3(4): 21-24,54; 1972.*

The indiscriminate use of pesticides causes rather than solves serious pest problems and subsequently creates food shortages and high prices. Pesticides destroy the balance of nature by unintentionally killing beneficial organisms rather than pests and by developing increasingly resistant pests. Many pesticides which are carcinogenic, teratogenic, and lethally toxic threaten human health. A 1969 survey indicated that half of the children in a rural clinic in a California farming county had one or more symptoms of pesticide poisoning. The sale, publicity, and advertising tactics of the large pesticide-producing companies and the National Agricultural Chemicals Association have convinced farmers, legislators, scientists, educators, and lay people alike that pesticides are necessary, beneficial, and nonharmful. Those who disagree with these campaigns and speak out against the indiscriminate use of pesticides are often ignored, ridiculed, and even professionally penalized.

74-1268. Anonymous. **[Mercury problems and agricultural chemicals, Part 1.]** *Noyaku Bijinesu (Pestic. Business) 131 : 1085-1086; 1974.* (9 references) (Japanese)

The outspoken condemnation of all pesticides, especially organomercurials, after the incidence of Minamata disease is criticized. A series of articles discusses problems with mercury in Japan and tests that have been conducted to obtain information on mercury's effects. The results of feeding methylmercury to monkeys in 1971 are described. After these tests the Ministry of Health and Welfare adopted the maximal no-effect level of mercury, 0.03 mg/day/kg body weight in monkey, multiplied it by 50 (safety factor), and calculated the maximum no-effect level for a person of 50 kg as 0.21 mg of Hg/week. After considering the WHO's temporary tolerance of mercury (0.2 mg/week/60 kg), the Ministry established the national temporary tolerance of mercury as 0.17 mg/week for an adult. The temporary tolerance in fish is 0.3 ppm, based on the tolerance and the average human intake of 108.9 g fish/day.

74-1269. Anonymous. **[Mercury problem and agricultural chemicals, Part II.]** *Noyaku Bijinesu (Pestic. Business) 132: 1093-1094; 1974.* (Japanese)

The natural deposits of mercury in Japan are in mines in seven regions. In reviewing the amount of transport and degradation of mercury in natural cycle, it is found that the industrial (or agricultural) transfer of mercury into the natural environment is extremely small compared to the gaseous evaporation of mercury from the natural resources to the atmosphere. A Japanese scientist has pointed out that the fish with the highest methyl mercury residues in Japan come from rivers flowing out of mercury mines; therefore, mercury mines are much more serious sources of environmental contamination than agricultural sources. According to official reports and testimonies, approximately 400 tons of mercury have been sprayed annually in the rice fields since 1952; 6800 tons of mercury deposited over 17 years could not readily disappear from the soil. Although the use of phenyl mercury is totally prohibited, soil fumigants and seed disinfectants such as Usupurun (uspulan), ruberon, soilsin, and similton (all ethyl mercury) are still in use; these mercury disinfectants are discharged into sewage, river, and other areas freely. Seedling beds for rice, wheat, tomatoes, and other produce are sprayed at the rate of 4.5 kg per 10 ares.

74-1270. Anonymous. **[Mercury problems and agricultural chemicals, Part III.]** *Noyaku Bijinesu (Pestic. Business) 133: 1101-1102; 1974.* (Japanese)

The statements and testimonies of influential witnesses quoted in part II of this series are refuted. First, the total amount of mercury used for agriculture between 1953 and 1972 was 2300 tons according to the calculations per sources, with the peak of 270 tons in 1965. Second, the use of mercurial soil fumigant was banned in March 1970, therefore, soils in and similton are not in use at the present time. Third, when 20 ppm of mercury solution is applied to a fruit tree and 100-200 l. of solution to the tilled soil around the tree, the total mercury used on one liter of soil is 1.9 mg. The actual mercury use is thus localized on orchards; but even if it were totally and evenly sprayed over the entire acreage of orchard, the amount of mercury used on an orchard of 10 a is about 1 kg. For spraying leaves and stems, 0.15-0.3% solution of phenyl mercury salt is used and the total mercury content is approximately 20 ppm. Therefore, one or two sprays over 10 a of an orchard will amount to 2-20 g of mercury.

74-1271. Anonymous. **[Mercury problems and agricultural chemicals, Part IV.]** *Noyaku Bijinesu (Pestic. Business) 134: 1109-1110; 1974.* (Japanese)

More than 70% of consumed mercury for agricultural use was phenylmercury chloride and iodide; effluent spent mercurial catalyst from factories caused Minamata disease. The fate of organomercurials applied in arable lands, especially in paddy fields, is discussed. According to the experimental results, the amount of applied phenylmercury acetate which adhered to the rice plant was 10%. About 50% of the adhered amount penetrated into the plant. When the application was carried out in ear premodia stage and ear sprouting period, 5% of penetrated mercury went into brown rice grain; 60-70% of mercury in brown rice was distributed in edible part (polished rice), the remaining being in the bran. Thus 99% of applied mercury to the plant drifted down to the paddy field and was reabsorbed by the

plant. In another experiment potted rice plants were grown in soil which contained mercury (as phenyl mercury acetate) corresponding to 100 years and 20 years continued application. The distribution of mercury in whole plant was respectively as follows: 0.63 and 0.43 (0.05) in brown rice grain, 0.22, 0.20 (0.17) in hull, 1.07, 1.00 (0.71) in leaf, 0.52, 0.41 (0.23) in leaf sheath, and 3.32, 0.67, (0.23) ppm(Hg) in leaf sheath in water, the figure in parentheses being the mercury content of plants grown in ordinary paddy soil. However, the mercury content of brown rice grain from the plants grown in the same pot after 2 years was 0.14, 0.09 (0.05) ppm showing that phenyl mercury acetate became less easily absorbed by the rice plant. According to the official analytical data, mercury residues in brown rice harvested from 1968 through 1971 were 0.016 ppm in 1969 and 1970, and 0.012 ppm in 1971, the value being nearly the same as that harvested in 1936 and 1937 of 0.01-0.035 ppm when no mercurial pesticides had been applied.

74-1272. Anonymous. **[Mercury problems and agricultural chemicals, Part V.]** *Noyaku Bijinesu (Pestic. Business) 135: 1117-1118; 1974.* (4 references) (Japanese)

The problems of mercury in rice plants are discussed. Applied mercury compounds have a general formula of R-Hg-X where X is an acidic group and R is usually phenyl or tolyl with the exception of methyl, ethyl, methoxyethyl, or chloromethoxyethyl. An experimental result showed that brown rice from plants treated with phenyl mercury compound contained 0.35-0.84 ppm Hg of which 11-17% was phenyl mercury type, suggesting the predominance of cleavage of R-Hg bond during absorption and translocation, and even after translocation to brown rice. In paddy fields, in spite of almost no change in total mercury after 142 days, phenyl mercury was undetectable after 5-6 weeks. In dry fields total mercury disappeared slower than in paddy fields. According to some scientists, the organomercury, except for the part evaporating into air, was adsorbed on soil particles and then decomposed to form sulfide, especially in paddy fields which are apt to be anaerobic. It would be one of the reasons why mercury is not absorbed much into rice plants even after many years of continued application of organomercury pesticides which leave large residues of Hg in the paddy soil. According to another study, there are three types of mercury residues depending on concentration, the depth of the soil, and the type of fields.

74-1273. Anonymous. **[Mercury problems and agricultural chemicals, Part VI.]** *Noyaku Bijinesu (Pestic. Business) 136: 1127-1128; 1974.* (4 references) (Japanese)

The adsorbing abilities of montmorillonite, kaolinite, and allophane for phenyl mercury acetate are discussed and the evaporation of mercury from soil described. The results refer to soil investigations in Nagano Prefecture carried out three years after the application of mercurial pesticides on 146 different places was stopped. The residual concentration in surface soil (0-10 cm in depth) and in a little deeper soil (30-40 cm in depth) was respectively 0.267 and 0.158 ppm in paddy field, 0.244 and 0.160 ppm in upland soil, 0.270 and 0.119 ppm in orchard soil, and 0.207 and 0.140 ppm in woodland and wilderness. In Nagano Prefecture the total amount of mercury applied from 1953 amounts to about 60 tons which corresponds to 0.5 ppm average concentration of soil. If the mercury residue in soil of woodlands is part of the natural background, the difference of mercury residue in paddy field and in woodland, 0.06 ppm, would be due to the applied mercurial pesticides. Considering the stronger adsorbing tendency of paddy soil in the Prefecture, about 90% of applied mercury should have evaporated. One study showed that 14-16% of the phenyl mercury acetate added to soil evaporated after 28 days. These facts support the assumption that the phenyl mercury acetate applied to paddy field is tranformed to another state and slowly disappears in the dried field after the harvest. Studies show that mercury residues in Japanese people average 6.02 ± 2.88 ppm as compared to that in non-Japanese peoples of 1.89 ± 1.47 ppm; the difference is attributed to mercurial pesticides.

74-1274. Anonymous. **[Mercury problems and agricultural chemicals, Part VII.]** *Noyaku Bijinesu (Pestic. Business) 137: 1133-1134; 1974.* (10 references) (Japanese)

Studies have shown that the switch from organic mercurial pesticides to non-mercurial ones used mainly for scattering on paddy fields was completed within two years beginning in 1967. Mercury found in Japanese human hair did not originate in the rice to which organomercurial pesticides had been applied. A very high mercury content has been found in hair of people who eat large amounts of tuna: a maximal value of 69 ppm with an average of 24.3 ppm. According to another investigation, the total mercury content of tuna averaged 0.70 ± 0.43 ppm (60 specimens). Of that, 70-90% of the mercury was methyl mercury which is easily absorbed in human intestines. Another opinion holds that phenyl mercury acetate, itself not the origin of mercury in hair, is easily converted to inorganic mercury, and inorganic mercury in tuna was metabolized to methyl mercury by anaerobic bacteria.

74-1275. Anonymous. **[Mercury problems and agricultural chemicals, Part VIII.]** *Noyaku Bijinesu (Pestic. Business) 138: 1141-1142; 1974.* (Japanese)

The methylation of inorganic mercury by microorganisms is not denied, but attributing mercury in human hair to organomercury pesticide (phenyl mercury

acetate or iodide) is questioned. Mercury contamination in Japan and other countries is discussed. Seed disinfection in Sweden with methyl mercury resulted in large scale deaths of wild birds which ate the methyl mercury containing seeds sown in the field without soil coverage. In Sweden methyl mercury was replaced by methoxyethyl mercury in Jan. 1966, reducing the mercury in birds' body. In Japan seed dressing is mainly carried out on rice seeds just before sowing. The seedlings are transplanted in broad area of paddy fields with little danger of being mistakenly consumed by people and birds. The rate of distribution is less in Japan than in Sweden. The poisoning of 600 inhabitants in Iraq who ate wheat and barley sterilized by mercurial disinfectants could not have occurred in Japan, even when organomercurial pesticides were not banned.

74-1276. Anonymous. **[Mercury problems and agricultural chemicals, Part IX.]** *Noyaku Bijinesu (Pestic. Business) 139: 1149-1150; 1974.* (25 references) (Japanese)

Several published statistical figures are questioned. For instance, in Sweden, mercury applied as pesticide was 317 tons in 1966 according to FAO's annual report of 1971; according to the report of IAEA entitled Mercurial Pollution to Humans and Environment, it was only two tons. In the latter report, the expenditure of mercurial pesticides in Japan was 1600 tons (calculated as Hg), considered impossible. The amount of Hg accumulated was 4-5 g/ha in Sweden, 6 g/ha in England, France and Germany, and 9 g/ha in the Netherlands during these 12 years as compared to 730 g/ha in Japan. The last figure is unacceptable. In Sweden 80% of the arable land is sown with seed sterilized with methyl mercury at the rate of 4 g/ha (200 kg of seed sown per ha and 20 mg of Hg per kg of seed), resulting in 40 g/ha of Hg during 12 years. Since the mercury in soil does not remain unchanged and since some soil is naturally polluted, it would be absurd to say that one who wishes to obtain mercury should go to a Japanese paddy field.

74-1277. Nakamura, H. (Agr. Chem. Inspection Station, Min. of Agr. and Forestry, Japan). **[Pesticide residues in/on crops and the application standard of pesticides for agriculture.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 397-401; 1973.* (Japanese)

The meaning of determining pesticide residues in agricultural commodities was described. The results of investigations of pesticide residues on crops were published in Results of Investigation and Research for the Urgent Countermeasures Concerning Pesticide Residues sponsored by the Agriculture, Forestry and Fisheries Research Council. The report is concerned with the residues of 160 combinations of 47 pesticides on 20 crops after intentional application of pesticides during 1967-1970. Since 1971 the Environmental Agency took over residue surveillance as the Enterprise of Investigation of Countermeasures for Pesticide Residues. The Ministry of Health and Welfare has also started pesticide residue investigations on crops in the markets and the farmhouses. The Ministry has accumulated data on 52 vegetable foods, has established the pesticide residue standard (so-called tolerance) on several crops and several pesticides based on the Food Hygiene Act, and published the application standard of the pesticides which must not leave residues above the established tolerance. When new pesticides are registered or when pesticides with expired term of validity are re-registered, the limits are given with the registration. It is hoped that residues will be kept at a safe level rather than generating the need for established limits.

74-1278. Ishimoto, S.; Yamamoto, M.; Nutahara, M. (Sect. of Agr. Technol., Dept. of Agr. and Forestry, Kochi Prefectural Office, Kochi, Japan). **[Countermeasure of pesticide residues in Kochi Prefecture.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 425-427; 1973.* (5 references) (Japanese)

The Prefecture has been trying to eliminate strongly toxic or highly persistent pesticides since 1964. In 1970 almost all the pesticides used in the Prefecture were moderately toxic or less toxic substances and resulted in almost no poisoning cases during application. Kochi was the first Prefecture to ban DDT, restrict BHC, and ban polychlorocyclodienes, long before the national ban of these pesticides. Despite these countermeasures, β-BHC was present in cow's milk from the Prefecture as determined by the Kochi Inst. of Hygiene. Problems have been apparent throughout Japan. Polychlorocyclodiene residues in cucumber were over the national tolerance in the Prefecture. Since 1971 studies have been carried out to cultivate cucumbers safely, to select vegetables which do not absorb residues from soil, and to accelerate the degradation of such residues in soil. These problems have been almost solved, and the translocation of soil residue to several parts of plants (cucumber and egg plant) was partly elucidated. The Prefecture intends to adopt stricter regulations than those of the Government, considering the special situations of the Prefecture, and to establish standards concerning the pesticides and their use which the Government has not yet decided.

74-1279. Goto, S. (Inst. of Environmental Toxicology, Kodaira, Tokyo, Japan). **[Problems in the investigation of pesticide residues in Japan.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 431-435; 1973.* (4 references) (Japanese)

The investigation of pesticide residues begun in 1967 by the Agriculture, Forestry and Fisheries Research Council was taken over by the Environment Agency and is still under way. By amendment of the Law of Agricultural Chemicals Regulation in 1971, all the pesticides seeking registration must be provided with

test data concerning their persistency (residues and major metabolites). Major problems concerning the testing of residues in Japan are described: design of the test such as number and area of plots, times and season of application, the harvest season of specimen and their appropriate combination; amount and preparation of specimen and allowances for variations in the field; transportation of specimen from the field to the analytical laboratory and the temperature during transportation; packaging of specimen, especially in the case of soil; analytical procedures and prevention of the alteration of residues during pre-analytical process (i.e. degradation by enzymes when specimen is in homogenized state) including cleanup technique, solvent for extraction, and selection of appropriate detector for gas chromatograph. Other general problems include the time involved for a pesticide to be registered: results of studies in at least 2 fields for 1 year and effects on at least one crop are necessary. Multiple applications of pesticides creates other problems and a need for new tests. Small scale model experiments are generally proposed.

74-1280. Shirasu, Y. (Inst. of Environmental Toxicol., Kodaira, Tokyo, Japan). **[The present state of pesticide toxicity testing and the problems.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 436-439; 1973.* (Japanese)

The toxicity data which must be presented when a pesticide used for agricultural purposes comes up for registration are described. According to the amendment of the Law of Agricultural Chemicals Regulation, chronic toxicity data for two years and data concerning effects on the second generation are necessary. Other types of data required include acute toxicity data where LD50 (to both sexes of at least two mammals by oral administration, subcutaneous or intramuscular and intraperitoneal or intravenous injection) and acute ocular and dermal toxicity are needed. Subacute toxicity data is obtained by feeding the compound-containing feed to at least two mammals for three months and deciding the dose rate of chronic toxicity. The chronic toxicity test is used for finding the maximum no-effect level, the minimum intoxicating level, and the definitive intoxicating level, and examines symptoms, body weight, feed intake, mortality ratio, blood picture, and urine. Pathohistological observations are made at autopsy. The effects on the second generation are studied by examining the malformations of fetuses of treated male and female rats or mice. The effects on living animals are judged through physiological functions. The fate of the compound in the mammal's body and information on metabolites and accumulation are needed. Other studies test for carcinogenicity and acute toxicity, TLm, for a fish (young carp). Problems involved are how to estimate the toxicity to humans from the results on experimental animals; species specificity; and effects of minute impurities which may by contained in technical compound. One problem in Japan is the need for facilities for conducting the many experiments.

74-1281. Doi, R. (Dept. of Health, Tokyo Metropolitan Res. Inst. for Environ. Protection, Tokyo, Japan). **[One of the problems of studying environmental pollution—the analysis of biological specimens. The transition of pollution seen from biological specimens.]** *Sogo Rinsho (Clin. All-Round) 23(1): 7-19; 1974.* (41 references) (Japanese)

Problems in monitoring environmental pollution by utilizing biological specimens are described on the basis of pollution from mercury, DDT, and PCB. Specimens must first be collected and analyzed correctly. Methods of collection differ depending on whether the study is ecology or food hygiene oriented. The average content of mercury obtained from groups of different kinds of fish is important for food hygiene, but meaningless ecologically and also erroneous. Pollutant accumulation in biological specimens varies due to the food chain, and some pollutants, like organochlorine pesticides and mercury take other routes in the body. Cases of environmental pollution by organochlorine pesticides in reference to the existing literature are reviewed.

74-1282. Green, M. B. (Res. and Develop. Dept., Imperial Chemical Industries Ltd., The Heath, Runcorn Cheshire WA7 4QD, England). **Are herbicides too expensive?** *Weed Sci. 21(5): 374-378; 1973.* (2 references)

A true cost-benefit analysis requires consideration of all advantages and disadvantages to society as opposed to consideration only of income and expenditure, which is more properly called investment appraisal. The total discovery and development cost for each pesticide has increased to about $5.5 million, and the time from discovery to registration, to 6.5 years. Even after this expenditure, the development of the cash flow from the new product is difficult to predict. The need for new herbicides may be debated, but can probably be affirmed due to alterations in competition and balance of populations through use of existing herbicides. New farming techniques and crop varieties may demand new herbicides. Increasing costs of agricultural land will necessitate optimal land utilization. Amenity values of herbicides must also be considered in the overall assessment.

74-1283. Mel'nikov, N. N. (Author address not given). **Sovremennyye napravleniya razvitiya proizvodstva i primeneniya pestitsidov. [Current trends in the preparation and application of pesticides.]** *Zh. Vses. Khim. Obshchest. 18(5): 482-494; 1973.* (211 references) (Russian)

Current trends in the production and application of pesticides are surveyed with respect to hygienic and

ecological criteria. The production of organophosphate insecticides, aryl methylcarbamates and 2,4-D derived compounds has increased during the past years, while production of pesticide-fertilizer formulations has decreased. Substituting compounds with low toxicity to mammals for those of high toxicity, and easily degradable formulations for persistent pesticides, limiting the use of potentially toxic substances such as mercury, arsenic, lead, and selenium, and improving the application techniques to minimize worker contact with pesticide formulations are the basic trends in the production and application of pesticides. Homologation assays on new pesticides now include conventional toxicologic, genetic, carcinogenic, teratogenic, mutagenic, and ichthytoxicologic studies in animals such as rat, dog, and fish. Methylcarbamates, carboxin, thiabendazole, fuberidazole, benomyl, 2,4-D, and heterocyclic nitrogen compounds are among the new promising pesticides to be substituted for environmentally hazardous formulations.

74-1284. Johnston, D. W. (Dept. Zool., Univ. Florida, Gainesville, FL 32601). **Polychlorinated biphenyls in sea birds from Ascension Island, South Atlantic Ocean.** *Bull. Environ. Contam. Toxicol. 10(6): 368-371; 1973.* (11 references)

Pelagic-feeding birds taken in March 1972 on Ascension Island did not contain DDT metabolites or dieldrin. One or more tissues did contain polychlorinated biphenyls (PCBs), with highest levels found in the adipose tissue. The analytical method used did not cause loss of the chlorinated pesticides, but tests for possible losses of PCBs were not performed. The terns examined may have obtained their residues from food gathered anywhere over a huge expanse of the Atlantic Ocean.

74-1285. Benson, W. W.; Gabica, J.; Beecham, J. (Idaho Community Study on Pestic., Dept. Agr. Lab., Boise, ID 83702). **Pesticide and mercury levels in bear.** *Bull. Environ. Contam. Toxicol. 11(1): 1-4; 1974.* (9 references)

DDE was found in all eight samples of black bear taken during the 1972 hunting season, the highest residue being 2.055 ppb in body fat. DDT residues ranged from 0.074 to 0.715 ppb in muscle and 0.293 to 1.632 ppb in fat. DDT (TDE) and dieldrin were found in muscle tissue at lower levels. Ranges of mercury residues were 110-275 ppb in hair, 40-171 ppb in muscle, and 48-120 ppb in fat. Both pesticide and mercury residue levels were well below the maximum tolerances allowed in domestic livestock by the FDA.

74-1286. Bennett, G. W.; Ballee, D. L.; Hall, R. C.; Fahey, J. E.; Butts, W. L.; Osmun, J. V. (Dept. Entomol., Purdue Univ., West Lafayette, IN 47907). **Persistence and distribution of chlordane and dieldrin applied as termiticides.** *Bull. Environ. Contam. Toxicol. 11(1): 64-69; 1974.* (11 references)

After 21 years γ-chlordane applied around the foundation walls of a house remained primarily in the top 6-8 inches of the soil. Under a porch where no air, light, or moisture had penetrated, residues were highest in the 0-6.50 in. layer and lowest in the 9.76-13.00 in. layer. Very little horizontal movement of chlordane residues had occurred, since there were residues averaging 0.83 ppm in the 0-5 in. segment 0.5 ft. from the building and 0.07 ppm 10 ft. from the building. Dieldrin also remained almost entirely in the portion of soil to which it was applied. While 5.38 ppm was found in the 0-7 in. segment 0.5 ft. from the building, 0.94 ppm was found 10 ft. from the building. The 22-28 in. depth 0.5 ft. from the building contained only 0.08 ppm. Although 10-15% of the insecticides remained in the soil after 21 years, their horizontal and vertical movement is so restricted that environmental contamination from application of termiticides does not appear to be a problem.

74-1287. Kurtz, D. A.; Studholme, C. R. (Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802). **Recovery of trichlorfon (Dylox) and carbaryl (Sevin) in songbirds following spraying of forest for gypsy moth.** *Bull. Environ. Contam. Toxicol. 11(1): 78-84; 1974.* (6 references)

Trichlorfon was found in all songbirds collected in an 150-acre area 76 hr after spraying at a rate of 1 lb/A. The bluejay and crested flycatchers contained 0.01 μg/g, and Baltimore orioles contained from 0.013 to 0.04 μg/g. According to USDA standards for trichlorfon residues in meat and vegetables, these levels were small. No carbaryl residues were detected in towhees collected three days after spraying an area at a rate of 1 lb/A. These birds are ground feeders and were not expected to come in contact with as much insecticide as canopy feeders.

74-1288. King, W. B.; Lincer, J. L. (Int. Council Bird Preservation, Smithsonian Institution, Washington, DC 20560). **DDE residues in the endangered Hawaiian dark-rumped petrel (*Pterodroma phaeopygia sandwichensis*).** *Condor 75(4): 460-461; 1973.* (14 references)

Three eggs of the dark-rumped petrel found abandoned in the mouths of burrows or ejected from the burrow contained levels of DDE from 0.07 to 1.14 ppm on a wet weight basis or 0.63 to 11.50 on an extractable fat weight basis. Two of the eggs were broader and two were shorter than other eggs measured, but no eggs were measured before 1947 (pre-DDT). Autopsy of chicks indicated no internal or external lesions, but enlarged livers were noted. Since the dark-rumped petrel feeds well out at sea, there must be measurable amounts of DDT in the open ocean ecosystem of the Central Pacific that can and should be monitored through sampling of seabird populations.

74-1289. Lemperle, E.; Kerner, E.; Strecker, H.; Waibel, A. (Staatl. Weinbauinst., Freiburg/Breisgau, Germany). **Wirkstoffrueckstaende und Gaerbeeinflussungen nach Anwendung von Fungiciden im Weinbau. [Active ingredient residues and effects on fermentation after application of fungicides in grape growing.]** *Deut. Lebensmittel-Rundschau 69(9): 313-322; 1973.* (35 references) (German)

Grapes, musts, and wines were examined for fungicide residues following treatment with formulations containing methylmetriam, mancozeb, thiram, dichlofluanid, dimethylsulfanilide, folpet, captafol, dichlozoline, methyl-1-benzimidazole carbamate, methyl thiophanate, and benomyl. Dichlozoline was present at 0.02-0.3 ppm in new wine. Decomposition products of dimethylsulfanilide were present in the wine at 0.1-4.0 ppm. Other contact fungicides were no longer detectable after fermentation and filtration. Traces of methyl-1-benzimidazole carbamate, thiophanate methyl, and benomyl were carried over into the wine. Some of the

fungicides tested can interfere with fermentation, but this can be overcome by preclarification of the juice and using 1% of a pure yeast strain for fermentation. The fungicides did not impair the tastes of the wines produced.

74-1290. Ritter, W. F.; Johnson, H. P.; Lovely, W. G.; Molnau, M. (Agr. Eng. Dept., Univ. Delaware, Newark, DE 19711). **Atrazine, propachlor, and diazinon residues on small agricultural watersheds; runoff losses, persistence, and movement.** *Environ. Sci. Technol. 8(1): 38-42; 1974.* (11 references)

Atrazine, propachlor, and diazinon losses in sediment and surface runoff were measured from four watersheds ranging in size from 1.9-3.8 acres and located in the loessial soil region of western Iowa. Two of the watersheds were planted to ridged corn, and two were planted to surface-contoured corn. Movement of atrazine, propachlor, and diazinon in the soil profile and degradation of these pesticides were measured. Pesticide losses were much greater from the surface-contoured watersheds than the ridged watershed. Significant amounts of surface-applied atrazine and propachlor were removed from the surface-contoured watersheds by storms occurring shortly after the pesticides were applied. Insignificant amounts of diazinon were removed in the surface runoff and sediment. Generally, pesticide concentrations were higher in the sediment than in the runoff water; however, greater total losses were associated with the greater volume of water. (Author abstract reprinted by permission of the American Chemical Society)

74-1291. Khan, S. U. (Chem. Biol. Res. Inst., Canada Dept. Agr., Ottawa, Ontario, Canada). **Adsorption of 2,4-D from aqueous solution by fulvic acid-clay complex.** *Environ. Sci. Technol. 8(3): 236-238; 1974.* (21 references)

The adsorption of 2,4-D (2,4-dichlorophenoxy acetic acid) from aqueous solution by a fulvic acid-clay complex has been investigated. The equilibrium data followed the Freundlich-type isotherm. The relatively low values of the isosteric heat of adsorption indicated a physical type of adsorption. (Author abstract reprinted by permission of the American Chemical Society)

74-1292. Bellet, E. M.; Casida, J. E. (Office of Pesticide Programs, Environ. Protect. Agency, Washington, DC 20460). **Products of peracid oxidation of organothiophosphorus compounds.** *J. Agr. Food Chem. 22(2): 207-211; 1974.* (21 references)

Organothiophosphorus compounds react with equimolar *m*-chloroperoxybenzoic acid in dichloromethane or chloroform, yielding simple to complex mixtures depending on the moieties bonded to the phosphorus and the type of phosphorus-sulfur bond. Phosphates are not degraded. Phosphoramidothiolates are probably attacked at the thiolate sulfur. Several phosphoro- and phosphonothionates and one phosphoramidothionate form variable amounts of the corresponding oxon, elemental sulfur, and cleavage products. One trialkylphosphine sulfide gives only the oxon and elemental sulfur. Phosphoro- and phosphonodithioates yield small amounts of the oxon and elemental sulfur, with large amounts of nonphosphorus containing disulfides and the phosphorus acids resulting on cleavage. An additional product from the *O*-alkyl S-substituted phenyl phosphonodithioates is the corresponding substituted phenyl phosphinyl disulfide. The peracid oxidation products are often identical to those formed by microsomal oxidase metabolism and by photodecomposition. This procedure provides a chemical means of generating possible oxidative metabolites and photoproducts from thiophosphorus insecticide chemicals. (Author abstract reprinted by permission of the American Chemical Society)

74-1293. Ueda, K.; Gaughan, L. C.; Casida, J. E. (Div. Entomol. and Parasitol., Univ. of California, Berkeley, CA 94720). **Photodecomposition of resmethrin and related pyrethroids.** *J. Agr. Food Chem. 22(2): 212-220; 1974.* (16 references)

Photodecomposition of resmethrin on various surfaces or in water yields the following products: nonisomerized chrysanthemic acid, phenylacetic acid, benzyl alcohol, benzaldehyde, and benzoic acid from cleavage reactions; the chrysanthemates of 5-hydroxy-3-oxo-4-phenyl-1-cyclopentenylmethanol, 2-benzyloxy-5-oxo-2,5-dihydro-3-furylmethanol, and 5-benzyl-5-hydroxy-2-oxo-2,5-dihydro-3-furylmethanol; the isomeric epoxychrysanthemates with the alcohol moiety unmodified or with the first alcohol mentioned above; and many unidentified photoproducts, mostly esters. The ester photoproducts oxidized in the alcohol moiety probably originate from a cyclic peroxide. (+)-*trans*-Chrysanthemic acid is more toxic than resmethrin on intraperitoneal administration to mice. Photoepoxidation reduces the toxicity of resmethrin and some other chrysanthemates and ethanochrysanthemates to houseflies. The unpleasant odor of photodecomposed resmethrin is due, in part, to phenylacetic acid. Structural features limiting the persistence of resmethrin and related pyrethroids include the easily epoxidized isobutenyl and cyclopentylidenemethyl groups, the photolytically labile ester group, and, particularly, the photosensitive furan ring. (Author abstract reprinted by permission of the American Chemical Society)

74-1294. Woodham, D. W.; Hatchett, J. C.; Bond, C. A. (Environ. Qual. Lab., Brownsville, TX 78520). **Comparison of dimethoate and dimethoxon residues in citrus leaves and grapefruit following foliar treatment with dimethoate wettable powder with and without sur-**

factant. *J. Agr. Food Chem. 22(2): 239-242; 1974.* (11 references)

Residues of dimethoate and its oxygen analog (a dimethoate degradation product) on and in grapefruit peels, pulp, and leaves were investigated by a gas chromatographic-flame photometric detection (gc-FPD) procedure following treatment of citrus trees with dimethoate wettable-powder spray solution with and without surfactant. Addition of a surfactant to the spray mixture resulted in a more rapid penetration of the insecticide into the leaf than when a surfactant was not used. Disappearance was about equal, but residues on leaves through the 24-hr post-treatment period was less subject to removal by rainfall and other weathering factors because of their location in the internal portion of the leaves. No appreciable residues of dimethoate were detected in grapefruit pulp 14 days following treatment, well below the 2 ppm allowable tolerance for grapefruit. Residues in the peels were significantly higher with an average of 3.29 ppm detected 14 days following treatment. (Author abstract reprinted by permission of the American Chemical Society)

74-1295. Permyakova, N. M.; Gamazkova, I. L.; Sanin, V. A.; Tkachenko, I. V.; Manilenko, L. P. (Ukrainian Sci. Res. Inst. Plant Protection, USSR). **Ostatki dilora v sakharnoy svekle i kartofele posle obychnogo i malob"emnogo opryskivaniya. [Residues of dilor in sugar beets and potatoes after normal and low-volume application.]** *Khim. Sel. Khoz. 11(9): 677-678; 1973.* (3 references) (Russian)

Dilor was applied at 1.2 kg/ha for sugar beets and 0.5 kg/ha for potatoes at spray expenditures of 200 liter/ha and 25 liter/ha. Persistence and residue dynamics were studied. Dilor residues were not detected in sugar beet and potato leaves 20 days after treatment with 200 liter/ha. Dilor residues were detected in sugar beets for 20 days and in potato tubers for 30 days following treatment. When the same doses were applied at a spray expenditure of 25 liter/ha, dilor residues were found for a longer time in both leaves, roots, and potato tubers. Residues were not found at harvesting.

74-1296. Sokolov, M. S.; Knyr, L. L. (Author address not given). **Fotoliz, sorptsiya i migratsiya pestitsidov v pochvakh i landshaftakh. [Photolysis, adsorption, and migration of pesticides in soil and terrain (a literature review).]** *Khim. Sel. Khoz. 11(9): 683-688; 1973.* (24 references) (Russian)

Studies on the photolysis, sorption, and migration in the soil of various pesticides, and especially of halogenated phenoxyacetate derivatives, are reviewed. Photooxidation and metabolism of 2,4-D and other halogenated phenoxyacetate derivatives under short-wave UV light were determined. The intensity of the photooxidation was increased at elevated pH values and humidity and in the presence of riboflavin, flavin mononucleotide, zinc oxide, ferric salts, iodine, and mercury vapor. Increasing numbers of chlorine atoms in the aromatic ring reduced the water solubility and increased the adsorption rate of halogenated phenoxyacetate derivatives. The adsorption rates decrease in the succession humin, humic acids, and fulvic acids. Adsorption of ionogenic pesticides was strongly dependent on the soil pH value. Weak adsorption of anionic pesticides was observed in slightly acidic, neutral, and alkaline soils when the soil colloids were charged negatively. Halogenated phenoxyacetate derived pesticides are supposed to acquire increased reactivity and hydrolyzability upon adsorption. The soil moisture content and pesticide adsorption were directly related. The depth of penetration and the intensity of rain were inversely proportional. The migration of the pesticides in the soil may be due to diffusion together with the air present in the soil or with the soil moisture, to gravitational transport along with water, and to lateral transfer through capillaries.

74-1297. Buryy, V. S.; Goshka, A. T.; Kudevich, K. P.; Sannikov, G. P.; Gubareva, K. P. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Ostatki gerbitsidov, primenyavshchikhsya dlya ochistki kanalov, vo vneshney srede. [Environmental residues of herbicides, applied for cleaning canals.]** *Khim. Sel. Khoz. 11(9): 688-694; 1973.* (6 references) (Russian)

Monuron, diuron, and simazine residues were studied in water and soil samples, in organs and tissues of fish, and in aquatic plants in and around canals and ditches after weed control programs at an expenditure of 50 kg/ha. Diuron and simazine residues were found in water samples taken at distances up to 5-10 km from the site of herbicide application; the occurrence of monuron was limited to 2 km. The highest monuron concentration measured within the zone of application was 1.05-1.1 mg/liter three days after application. The diuron concentration peaked at 0.35-0.40 mg/liter 10-20 days after application. Considerable concentrations of simazine were found in the water for two months both within and beyond the zone of application. With the water flow being slow, the herbicides rapidly penetrated into the rhizosphere where they persisted for nearly two months; at higher flow rates (30-35 cm/sec) they were quantitatively leached out in 20 days. The diuron and monuron concentrations in the soil were usually below 1 mg/kg while the simazine levels considerably exceeded that level. The monuron concentrations in aquatic plants such as sedge, reed, and rush were usually lower than 1 mg/kg; however, diuron concentrations of 4 mg/kg and simazine concentrations of over 7 mg/kg were detected. Monuron decomposed quantitatively within one month in plants, but diuron and simazine were much more persistent. Spikes and burbots caught within the zone of herbicide application between the 10th and 20th days of herbicide application contained 0.08-0.1 mg of monuron and up to 0.15 mg of diuron per kg. The herbicide residues were highest in the branchia and the liver.

74-1298. Ware, D. M.; Addison, R. F. (Fish. Res. Board Canada, Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, Nova Scotia, Canada). **PCB residues in plankton from the Gulf of St. Lawrence.** *Nature (London) 246(5434/Supp.):519-521; 1973.* (12 references)

Residues of PCBs (polychlorinated biphenyls) in plankton taken off the coast of Prince Edward Island generally varied inversely with particle size. The GC method used to determine the residues selected peaks which did not overlap with those of the DDT group. Treatment with ethanolic KOH or CrO_3 did not produce significant changes in the PCB peaks which overlapped *p,p'*-DDE or *p,p'*-dichlorobenzophenone, suggesting that DDT group residues were too low to be reliably determined. The minimum amounts of PCB, DDE, and DDT which could be detected by the method were 0.2 to 2 ppm, 0.01 to 0.1 ppm, and 0.02 to 0.2 ppm, respectively.

74-1299. Weichart, G. (Deut. Hydrograph. Inst., Hamburg, Germany). **Verschmutzung der Nordsee. [Pollution of the North Sea.]** *Naturwissenschaften 60(10): 469-472; 1973.* (14 references) (German)

The North Sea is highly polluted since it receives large amounts of household and industrial wastes via river flow, direct dumping, and atmospheric fallout. Municipal sludge, which accounts for a large amount of the waste materials, represents a major source of heavy metal and chlorinated hydrocarbon contamination. The significance of the atmosphere as a route of ocean contamination was recently recognized. It has been estimated that about 300 tons of DDT per year are conveyed from the atmosphere into the North Sea. The North Sea water is gradually replenished by cleaner water from the Atlantic, but many coastal and estuarine areas remain highly contaminated due to constant influx of pollutants and low dilution rates.

74-1300. Juengst, F. W.; Alexander, M. (Cornell Univ., Ithaca, NY). **DDT: an anomalously resistant molecule.** *Naval Res. 26(12): 1-9; 1973.* (17 references)

Although DDT has been shown to be degraded by one or a series of microorganisms in the laboratory, it appears to be resistant to natural degradation in the ocean. It has been suggested that the concentration of the pesticide in lipids of living organisms and the binding of the chemical to dead algae and other organic matter render it unavailable to bacteria capable of decomposing it. Individual microbial populations in the ocean may inhibit the species capable of degrading it, or concentrations necessary for inducing required enzymes may not be present in the natural situation. Two previously unknown metabolites, probably organic acids, have been isolated from cultures of *Mucor alternans* in studies designed to shed further light on the anomalous behavior of DDT in natural waters. More research in this area is needed.

74-1301. Renard, J. L. (Departement de Phytopathologie (1), Institut de Recherches pour les Huiles et Oleagineux, France). **Transport et distribution du benomyl dans les palmiers a huile au stade de la pepiniere. [Transport and distribution of benomyl in oil palms at the seedling stage.]** *Oleagineux 28(12): 557-562; 1973.* (9 references) (French)

Transport and distribution of benomyl in palm leaves were studied after application of the fungicide in various ways. The presence of benomyl in plant materials was determined by the *Penicillium expansum* inhibition bioassay. Systemic migration of benomyl into palm leaves was confirmed. Benomyl was still detectable in palm leaves six months after watering with a solution containing 0.5 ml benomyl per plant. In a soil plot treated with 3 g benomyl per m^2 (30 ppm to a depth of 10 cm), a benomyl level equivalent to 13 ppm was detectable 50 days later. The continued appearance of benomyl in the leaves thus appears to be due to continuing absorption from the soil as well as persistence within the plant.

74-1302. Sikka, V. K.; Chopra, B.; Sethi, R. K.; Chopra, S. L. (Dept. Chem. Biochem., Punjab Agr. Univ., Ludhiana, India). **Persistence of Vitavax (5,6-dihydro-3-carbonanilido-2-methyl-1,4-oxathiin) residues on some crops.** *Pesticides 7(4): 28-29; 1973.*

Crop growth dilution appeared to account for the decreases in Vitavax (carboxin) residues in wheat and chick pea (gram) plants after treatment of the seed or foliage. Wheat plants grown from seed treated at 5.0 to 40.0 mg/100 g contained residues of from 1210 to 4820 ppm at the time of flowering and from 450 to 1795 ppm at the time of harvesting. In plants sprayed with Vitavax at rates ranging from 5 to 100 mg/pot residues of from 540 to 5275 ppm were present at flowering and from 180 to 3280 ppm at harvest. Similar results were obtained with seed-treated or foliar-treated gram plants. Residues recovered were 300, 250, and 150 ppm at 155 and 170 days after sowing treated seed and at harvest. However, residues were not recovered from the harvested gram grains. At 15 and 30 days after treatment with a 0.05% spray and at harvest, residues were 375, 140, and 60 ppm.

74-1303. Thakre, S. K. (Dept. Agr. Chem. Soil. Sci., College Agr., Parbhani, India). **Accumulation and distribution of chlorinated insecticides in soil and their effects on plant.** *Pesticides 7(5): 25-29; 1973.* (47 references)

A review of organochlorine distribution in soils indicates that low organic matter content of soil, low temperatures, and little vegetation favor persistence of these insecticides in soil. Persistence differs from one chemical to another; in several soils DDT has remained active the longest. Most of the organochlorines found are concentrated in the upper layer of soil even 13 years after application. Increasing moisture content, decreas-

ing organic content, and decreasing aeration of roots enhance uptake of the insecticides by plants. The plant roots are most often affected by insecticides although top growth and yields have also been influenced.

74-1304. Raman, S.; Krishnamoorthy, K. K. (Tamilnadu Agr. Univ., Coimbatore 641003, India). **Decomposition of the active ingredient of pesticides during storage.** *Pesticides 7(12): 20; 1973.* (6 references)

A survey of the stability of active ingredients in several pesticide formulations under normal storage conditions showed that the extent of degradation of the products may vary inversely with the concentration. Over a 24-month period heptachlor content decreased 16-22% in a 3% dust formulation. Approximately 3% of lindane was lost over a 16-month period. Carbaryl granules lost 3% of the active ingredient over 16 months. Over the same period 2% of malathion was lost from a 50% emulsifiable concentrate.

74-1305. Ford, J. H.; Hawthorne, J. C.; Markin, G. P. (U.S.D.A., Animal and Plant Health Inspect. Serv., Plant Protect. and Quarantine Prog., Environ. Qual. Lab., Gulfport, MS 39501). **Residues of mirex and certain other chlorinated hydrocarbon insecticides in beef fat–1971.** *Pestic. Monit. J. 7(2): 87-89; 1973.* (7 references)

Samples of fat from beef cattle were obtained in areas of Mississippi and Georgia where the insecticide mirex had been used to control the imported fire ant. Mirex residues were detected in 67 of the 77 fat samples analyzed with levels ranging from 0.001 (lowest level of detection) to 0.125 ppm, with an average residue level of 0.025 ppm. Sixty-nine samples of fat from beef cattle from nonmirex treated areas were also analyzed; none contained mirex. All fat samples contained residues of DDT. (Author abstract by permission)

74-1306. Benson, W. W.; Watson, M.; Wyllie, J. (Idaho Community Study on Pesticides, Idaho Dept. Environ. Commun. Serv., Statehouse, Boise, ID). **Organochlorine residues in wild moose, Idaho-1972.** *Pestic. Monit. J. 7(2): 97-99; 1973.* (123 references)

In 1972, samples of adipose tissue from 14 moose, *Alces alces shirasi,* from the Targhee National Forest in eastern Idaho were analyzed by gas-liquid chromatography for organochlorine residues. Residues detected and respective mean levels for each were: *p,p'*-DDT, 52.3 ppm; *p,p'*-DDE, 28.9 ppm; *p,p'*-DDD, 53.0 ppm; *a*-BHC, 77.5 ppb; and dieldrin, 5.0 ppb. The presence of significant BHC levels in these animals probably reflects the prior use of BHC within the forest for control of pine bark beetle infestation. (Author abstract by permission)

74-1307. McLane, M. A. R.; Stickel, L. F.; Clark, E. R.; Hughes, D. L. (Patuxent Wildl. Res. Cent., U.S. Bur. Sport Fish. Wildl., Laurel, MD 20810). **Organochlorine residues in woodcock wings, 11 states–1970-71.** *Pestic. Monit. J. 7(2): 100-103; 1973.* (9 references)

A survey of organochlorine residues in woodcock wings was undertaken to determine whether these wings are suitable for showing regional differences in residues and to obtain a baseline in 1970-71 for later comparisons. Woodcock wings were obtained from the annual hunter's wing survey. Samples came from eight States (Louisiana, Maine, Michigan, New Hampshire, New Jersey, New York, Pennsylvania, and Wisconsin) and one tri-State area (North Carolina, South Carolina, and Georgia). Wings from the tri-State area contained significantly higher ($P < 0.01$) concentrations of DDT (including DDT, DDD, and DDE) than those from other States. Concentrations of polychlorinated biphenyls (PCB's) also were significantly higher ($P < 0.005$) in samples from these three States. Wings from Louisiana and the tri-State area had significantly higher ($P < 0.01$) concentrations of dieldrin than wings from the other States, and those from Louisiana had significantly higher ($P < 0.01$) concentrations of mirex than those from other States. The compounds detected and the ranges of residue means for all sampling areas were as follows: Total DDT (5.89–65.15 ppm); DDT (0.34–14.93 ppm); DDE (4.66–47.47 ppm); DDD (0.11–3.44 ppm); mirex (0.76–16.93 ppm); dieldrin (0.09–3.06 ppm); and PCB's (4.27–8.63 ppm). Woodcock wings appear to be suitable for determining regional differences in organochlorine residues in this species. (Author abstract by permission)

74-1308. Naqvi, S. M.; de la Cruz, A. A. (Dept. Biol., Alcorn A and M College, Lorman, MS 39096). **Mirex incorporation in the environment: residues in nontarget organisms–1972.** *Pestic. Monit. J. 7(2): 104-111; 1973.* (9 references)

A total of 78 samples representing 42 species of invertebrates, 3 species of fish, and 1 frog tadpole were randomly collected in 1972 from five sampling sites in Mississippi which had received varying degrees of mirex treatment. The samples were analyzed for mirex residues by gas chromatography. Residue levels in most samples were generally less than 1 ppm. Analyses of data provided observations on average residues (ppm) of pooled samples according to the following categories: (1) by type of organism–mollusks (0.15), fish (0.26), insects (0.29), crustaceans (0.44), and annelids (0.63); (2) by habitat–estuary (0.20), lake (0.27), grassland (0.28), creek (0.31), and pond (0.37); (3) by degree of mirex treatment at sampling site–localized treatment on fire ant mound (0.12), no treatment (0.19-0.20), aerial treatment in 1972 (0.33), and aerial treatment in 1968-70 (0.38); and (4) by trophic level–herbivore (0.23), carnivore (0.30), and omnivore (0.35). Mirex residues in animals collected from areas not treated with mirex suggest widespread movement of this pesticide in the environment, and the residues observed in the

various trophic levels may be indicative of biological magnification. (Author abstract by permission)

74-1309. Wolfe, J. L.; Norment, B. R. (Dept. Zool., Mississippi State Univ., Mississippi State, MS 39762). **Accumulation of mirex residues in selected organisms after an aerial treatment, Mississippi–1971-72.** *Pestic. Monit. J. 7(2): 112-116; 1973.* (11 references)

Mirex residues were monitored in selected organisms in Mattubby Creek Watershed, Monroe County, Miss., for approximately 1 year following an aerial application of 1X mirex bait (0.85 g/acre). Although there was an increase in residues in crayfish, levels remained relatively low in invertebrates as compared to those previously reported. Fishes from streams in the treated areas showed an increase in residues of about 2 to 20 times over controls taken from an adjacent watershed. These levels in stream fishes remained relatively constant for 7 months after treatment, when the last sample was taken. Residue levels in mammals were obviously stratified according to food habits. Strict herbivores had the lowest levels, omnivores intermediate levels, and insectivore-carnivores the highest levels. Generally, the residues detected were lower than those previously reported and presumably reflected the lower rate of mirex application (1X rate versus the normal 4X or 2X rate) The fact that the compound was concentrated by certain nontarget organisms even at this low rate of application and stratified by trophic level is worthy of note. (Author abstract by permission)

74-1310. Hodges, L. R.; Lear, B. (Dept. Nematol., Univ. California, Davis, CA 95616). **Effect of time of irrigation on the distribution of 1,2-dibromo-3-chloropropane in soil after shallow injection.** *Pestic. Sci. 4(6): 795-799; 1973.* (3 references)

The effect of irrigation time on the dispersion of 1,2-dibromo-3-chloropropane (DBCP) in soil after a shallow injection treatment was determined for Yolo fine sandy loam. When injections equivalent to 23.5 liters of DBCP/ha at a depth of 7 to 8 cm were subsequently followed by 15 cm of irrigation water, adequate distribution of DBCP was obtained if the soil was irrigated within 5 days. However, the most rapid and deepest penetration of fumigant was obtained by irrigating 2 to 5 days after application. There was insufficient downward movement of DBCP in non-irrigated soil. (Author abstract by permission)

74-1311. Wierszyllowski, J.; Fiszer, W.; Ugolik, M. (Instytut Produkcji Ogrodniczej, Poznan, Poland). **Zawartosc kwasu 2, 4, 5-trojchlorofenoksyoctowego-1-14C w partenokarpicznych owocach, szypulkach i podsadkach wisni. [Distribution of 2,4,5-trichlorophenoxyacetic acid-1-carbon-14 in parthenocarpic fruits, pedicles and bracts.]** *Poznan. Tow. Pryzj. Nauk, Wydz. Nauk Roln. Les. Pr. Kom. Nauk Roln. Kom. Nauk Les. 35: 367-373; 1973.* (8 references) (Polish)

The distribution of ^{14}C-labeled 2,4,5-trichlorophenoxyacetic acid in parthenocarpic fruits, pedicles and bracts of sour cherry was studied under field conditions. The total radioactivity was found in fruits, flesh, pedicles, and bracts one hour after treatment. The radioactivity declined to 28.7% and 20.0% of the original value by 22 and 72 days after treatment in fruits, 3.1% after 72 days in the endocarp, and 10.4% and 6.0% of the original radioactivity after 22 and 72 days in the bracts, respectively. The reduction of the radioactivity in the fruits, endocarps, and bracts was most rapid during the first 20 days after treatment.

74-1312. Patterson, J. M.; Smith, W. T., Jr. (Dept. Chem., Univ. Kentucky, Lexington, KY). **Investigations on the pyrolytic interaction between maleic hydrazide and tobacco.** *Proceedings of the Tobacco and Health Workshop Conference No. 4, Lexington, Kentucky, March 1973, pp. 453-473.* (8 references)

Pure maleic hydrazide, subjected to the approximate coal temperature of cigarettes (850°) in a classical pyrolysis apparatus, was about 60% converted to gases in a nitrogen atmosphere. Water, water soluble compounds, ether-insoluble tar and ash accounted for about 30% of the material. The remainder was condensate which could be separated into neutral, acid, and base fractions. Benzo(a)pyrene was formed at a rate of 130μg/g in nitrogen and 155μg/g in air. In a controlled pyrolysis apparatus at 600° 41% was converted to gases, predominantly carbon dioxide and ammonia, 45-50% to a hard black insoluble residue, and 5% remained unchanged. Pyrolysis gases contained free radicals. Using a colorimetric procedure, maleic hydrazide was determined in cigarette smoke; the maleic hydrazide/nicotine ratio was determined and found to be primarily influenced by the initial concentration of maleic hydrazide on the tobacco.

74-1313. Davis, D. L.; Atkinson, W. O. (Dept. Agronomy, Univ. Kentucky, Lexington, KY). **Effect of application methods on maleic hydrazide residue on burley tobacco.** *Proceedings of the Tobacco and Health Workshop Conference No. 4, Lexington, Kentucky, March 1973, pp. 761-767.* (22 references)

Residues of maleic hydrazide (MH) in stems or laminae of air-cured burley tobacco plants were greatly altered by using different methods of application. A 62% reduction in residues in the laminae was obtained by harvesting 31 instead of 21 days after application of 170 mg active MH. Residues were also drastically reduced when the application rate was 120 instead of 170 mg/plant, and effective sucker control was obtained at the lower rate. Splitting the application resulted in larger residues, as did application of MH in combination with Off Shoot T (fatty alcohol).

74-1314. Dorough, H. W. (Dept. Entomol., Univ. Kentucky, Lexington, KY). **Fate of insecticides in tobacco plants and factors influencing their levels in tobacco products.** *Proceedings of the Tobacco and Health Workshop Conference No. 4, Lexington, Kentucky, March 1973, pp. 796-828.*

Commercial cigarettes purchased in 1970, 1971, and 1972 in Kentucky contained 36, 44, and 27 ppm total DDT residues, respectively, and 53% of this was TDE. Endosulfan was found in detectable quantities (0.4 ppm) only in the 1972 cigarettes, and dieldrin and endrin were not detected in any of the cigarette tobacco. Burley tobacco produced between 1963 and 1970 in Kentucky had total DDT as the predominant organochlorine residue. In addition, dieldrin, endrin, and in a few cases, toxaphene were found. Endosulfan was detected on 1969 and 1970 samples. Analysis of tobacco from auction markets indicated that DDT residues had decreased impressively in the 1972 crop. Tobacco from one area was almost totally free of organochlorine residues in 1971 and 1972. Since the use of DDT is now prohibited, future crops should not be contaminated with this insecticide. Some limitations on the use of endosulfan will have to be imposed in order to control the increasing presence of this contaminant.

74-1315. Peakall, D. B. (Sec. Ecol. Systematics, Cornell Univ., Ithaca, NY). **DDE: its presence in peregrine eggs in 1948.** *Science 183(4128): 673-674; 1974.* (10 references)

DDE and small amounts of DDT were found in the dried membranes of five peregrine eggshells collected in California from 1948-1950. The DDE content of the eggs, estimated on the basis of a mean ratio of 3.56:1 for DDE in egg contents to DDE in membranes and a ratio of 1:24 for lipid to wet weight, was sufficiently high to account for eggshell thinning. Since the contents of peregrine eggs are not available for the years prior to 1963, direct proof of the involvement of DDT during the 1940's in eggshell thinning has not been available.

74-1316. Nikolova, G. (Author address not given). **Razlagane na triazinovite kherbitsidi. [Decomposition of triazine herbicides.]** *Selskostop. Nauka 12(1): 67-70; 1973.* (Bulgarian)

Studies on the nonbiological and biological decomposition of triazines in soil and plants are reviewed. Oxytriazine was found as the principal degradation product of triazines following abiological decomposition. Rapid decomposition of atrazine was observed in sterile soils incubated for 24 hr at 50-65°C. The half-life of atrazine ranged from 180 hr at 107°C to 116 yr at 20°C. Triazines were taken up rapidly by the root system. Triazine-sensitive plants take up such herbicides readily while resistant species metabolize triazines rapidly into nontoxic substances. The biological degradation of triazines in the soil is most intense when optimal growth conditions for soil microflora are present.

74-1317. Kawahara, T. (Agr. Chem. Inspection Sta., Min. of Agr. and Forestry, Kodaira, Tokyo, Japan). **[The residues and the fates of organochlorine insecticides in soil.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 402-406; 1973.* (Japanese)

DDT and BHC have been banned; aldrin, dieldrin, and endrin have been severely restricted in their use; and heptachlor is no longer sold. Organochlorine insecticides persist in soil, especially polychlorocyclodienes, and many of the above remain in cropland owing to continued applications for many years with resulting harmful residues in vegetable crops. Organochlorine insecticide residues in soil are given based on the results of prefectural investigations of actual fields. Generally speaking, the residues rapidly disappear at first by evaporation, leaching, and translocation. Disappearance is exponential. Although there are local differences, the half-life of dieldrin plus aldrin is about one year. That of endrin is about seven months, shorter in flooded conditions or when manure is added and that of heptachlor is less than one month. According to the results of investigations in croplands, residues of BHC, DDT, aldrin plus dieldrin, and endrin in vegetables were respectively 0.0-2.0, > 2.0, < 0.5, and < 0.3 ppm in 1970 and 1971. The residues in crops depend upon the residues in soil and on the specific absorption property of the crops. Generally, residues are larger in root crops than in foliage crops. To accelerate the disappearance of the residues in soil, ploughing the soil deeper, keeping the field in flooded condition, or applying calcium hydroxide are recommended. One problem to be solved is ridding the soil of residues of endrin and dieldrin, especially where tobacco had been grown, to reduce residue levels in cucumber, potato, and spinach, subsequently planted.

74-1318. Kuwatsuka, S. (Fac. of Agr., Nagoya Univ., Nagoya, Japan). **[Residue and fate of herbicides in soil.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 407-413, 1973.* (17 references) (Japanese)

Studies on pesticide adsorption, translocation, degradation in soil, and effects on plants and soil microorganisms have been conducted, especially in the USA. However, the studies have been limited mainly to upland soil. Many factors affect pesticide residues in soil including chemical stability, degradation by microorganisms, evaporation rate, solubility, adsorption rate, rate of application, type of formulation, and method of application. Other factors involve the soil and include soil texture, content of organic matter, percentage of clay, acidity, ion-exchangeability, and microorganisms. Environmental factors include temperature, moisture conditions, irrigation, leaching, crops, and methods of cultivation. Generally speaking, the stability of commonly used herbicides is in the descending order as follows: urea derivatives, triazine derivatives, and picloram > benzoic acid derivatives and amides > phenoxy derivatives, toluidine derivatives and nitrile

derivatives > carbamate derivatives and aliphatic fatty acid derivatives.

74-1319. Suenaga, H. (Fukushima Prefectural Agr. Exp. Station, Koriyama City, Fukushima, Japan). **[Countermeasures to pesticide residues in Fukushima Prefecture.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 418-420; 1973.* (Japanese)

The location of this prefecture in the north east district of Japan has kept down the prevalence of plant pests and diseases. However, areas where fruit trees, tobacco, and vegetables are cultivated require relatively large use of organochlorine insecticides. Countermeasures for aldrin and dieldrin residues are described. The amount of polychlorocyclodienes used in the prefecture was 93.7, 135.6, 341.3, and 135.3 tons in 1965, 1968, 1969, and 1970. The residue on crops decreases with time after application is stopped. In cucumber fruit, the average residue was 0.035, 0.023, 0.015, and 0.01 ppm of actual fruit 1, 2, 3, and 4 year(s) after application. The tolerance is 0.02 ppm. The degradation of aldrin in soil is accelerated by adding manure, regulating pH of soil at 5.0, and turning over the soil once a week before planting. The results showed that all three methods were effective. Crops which should be planted in aldrin-rich soil are tomato, egg plant, pimiento, cabbage, and lettuce.

74-1320. Koyama, S. (Niigata Prefect. Agr. Exp. Sta., Nagaoka City, Niigata, Japan). **[Countermeasures to pesticide residues in Niigata Prefecture.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 421-422; 1973.* (Japanese)

Niigata Prefecture is one of the major rice producing prefectures of Japan; the amount of BHC formulation which was applied here prior to the BHC ban is enormous (for instance, 2500 tons of 6% BHC applied in 1970). Soil residues and residues in rice grain are still problems. According to the current investigation, the total BHC in soil (depth to 10 cm) before plowing, in soil after harvest, in brown rice, and in rice straw were 5.460-0.345, 0.986-0.180, 0.073-0.030, and 2.015-0.236 ppm respectively at four locations where much BHC was applied, and 0.111, 0.084, 0.014 and 0.230 ppm, respectively, in a field of the Research Station. The upper soil layer contained much α- and β-BHC, while the lower layer contained almost no β-isomer. The decrease of total BHC in soil was rapid during the first year; however, the rate of decrease then slowed down, resulting in a small amount persisting for a relatively long time. However, the residue in brown rice was already 0.073 ppm at most in a heavily used field. An investigation showed that some cucumbers and potatoes contained polychlorocyclodiene residues in excess of those in 1971; however, in 1973, all the crops of tomato, radish, cabbage, and spinach tested contained less than the tolerance or less than detection limit. Only in cucumber was a problem noted.

74-1321. Nagai, Y. (Tokushima Prefect. Agr. Exp. Sta., Ishii Town, Tokushima, Japan). **[Countermeasure for pesticide residues in Tokushima Prefecture.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 423-424; 1973.* (Japanese)

In 1970 the study of pesticide residues began with an investigation of aldrin residues in cucumber from vinyl greenhouse cultures. Just after the study started, the analytical data from cucumbers from several prefectures including Tokushima were published by Osaka Municipal Research Institute of Hygiene. A group was organized to investigate countermeasures. The group mainly traced aldrin and dieldrin residues in soil, cucumber, and spinach and established the planting standard for crops corresponding to the residual situation in soil. After investigating the aldrin residues in cucumber and in soil, a safety standard was established. The standard was expanded to cover spinach and tomato, then Japanese radish, and finally strawberry with some modifications to cucumber and spinach. In April 1972, after considering the residues of heptachlor in soil, Tokushima Prefecture recommended to postpone its use until the national government regulates it.

74-1322. Hori, K. (Kumamoto Prefect. Agr. Exp. Station, Kumamoto City, Kumamoto, Japan). **[Countermeasure of pesticide residues in Kumamoto Prefecture.]** *Shokubutsu Boeki (Plant Protect.) 27(10): 428-430; 1973.* (Japanese)

Due to the favorable climate many agricultural crops have been cultivated in the Prefecture. Concomitant large use of pesticides has resulted in many injuries including intoxication by pesticides and suicides and murders. Other injuries include damage to fish and shellfish by parathion (about 1955), by PCP herbicide (since 1962), by organomercury fungicide (1965), by organophosphorus insecticide (1973). Damages to silk worms, honey bees, and chickens and crop damage by pentachlorophenol (1969) have occurred. Pesticide residues were determined in these situations at an early date by experiments and were then monitored at the request of the Environment Agency. PCP was analyzed in rivers, rain, wells, and tap water. The PCP residue in rivers averaged 560 (5000-46) in 1970, 70 (1410-20) in 1971, and 69 (220-15) ppt in 1972 (max.-min.). β-BHC in cow milk was 0.125 (0.62-0.034) in 1970, 0.050 (0.26-0.013) in 1971, and 0.023 (0.074-0.012) ppm in 1972. By monitoring analyses of vegetables, fruits, tea leaves, water, and soil (400 specimens) the following data was obtained: organochlorine residues, organophosphorus residues, carbamates and metal containing pesticide residues were detected at levels lower than the standard. From 98 specimens of vegetables, there were only five cases of organochlorine residues greater than the standard, 19 specimens of tea leaves contained organochlorine pesticide residue less than the standard; 16 specimens of rice grain contained organochlorine residue less than the standard. In order to maintain safe veget-

able crops and milk the prefecture issued its own regulations on pesticides such as PCP, BHC, DDT, and polychlorocyclodienes and has prohibited contaminated rice straw for feeds and litters for cows.

74-1323. Kuwatsuka, S. (Nagoya Univ., Dept. of Agriculture, Japan). **[Adsorption, movement and degradation of herbicides in soils in relation to the phytotoxic action.]** *Shokubutsu No Kagaku Chosetsu (Chem. Regul. Plants) 8(2): 72-83; 1973.* (56 references) (Japanese)

The residue behavior and degradation of various types of herbicides in the soil and the period of degradation are discussed. Herbicides applied to the soil are degraded partially photochemically by solar radiation; the greater part is quickly adsorbed by soil particles; some are washed down by rain water and irrigation water, and some are dispersed in the atmosphere. Herbicide residue periods are in general longer than organophosphate pesticides (2-12 weeks), but shorter than organochlorines (2-5 years). Too rapid degradation of herbicides will defeat the purpose of the chemical, yet an over-long residue period will have damaging effects on the growth of produce. The shortest lasting carbamate herbicide remains in the soil at least one week, and the half-life of the slowest degrading urea herbicide is at most six months. The studies of Kearney et al. showed that the longest lasting urea group remained in the soil between 2 and 18 months, that of the phenoxyl group between 1 and 6 months, and the carbamates between 0.5 and 3 months. In reference to types of chemicals and soil adsorption, organic acid group herbicides (2,4-D, DPA, etc.) are easily transported; fenac, pyriclor, and DNBP chemicals are transported less easily; phenyl urea, triadine chemicals are hard to move; carbamates, toluidines transfer even less, and insolubles like NIP, DBN, trifluralin, and cations like paraquat and diquat are extremely hard to move, and these are adsorbed by the soil immediately. The degree of adsorption depends on the organic material content, clay content, mineral types, particle structure, water content, ion exchange capacity, temperature, and pH. The half-lives and the residual effectiveness of various herbicides are presented in a table, compiled from previously published materials.

74-1324. Saxena, S. K.; Boersma, L.; Lindstrom, F. T.; Young, J. L. (Oregon State Univ., Corvallis, OR). **The self-diffusion coefficients of ^{45}Ca and 2,4-dichlorophenoxyacetic acid.** *Soil. Sci. 117(1): 14-20; 1974.* (20 references)

The self-diffusion coefficient of ^{14}C-labeled 2,4-D was determined for a study on the effect of pore size on the diffusion coefficient of the herbicide. The agar method and the cell diffusion method were used and agreement of the methods was checked by determining the self-diffusion coefficient of ^{45}Ca. Diffusivities measured with the cell diffusion method were 0.70 cm^2/day of ^{45}Ca and 0.69 cm^2/day for 2,4-D. The agar method gave 0.66 cm^2/day for ^{45}Ca and 0.68 cm^2/day for 2,4-D.

74-1325. Yamagishi, T.; Horii, S.; Sakaino, Y.; Morimoto, K.; Takeba, K.; Haruta, M. (Tokyo Metropolitan Res. Lab. of Publ. Health, Tokyo, Japan). **[On the transition of the levels of organochlorine pesticide residues in milk.]** *Tokyo-to Eisei-Kyoku Gakkai-shi (Rep. Tokyo Pub. Health Stud.) 52: 34-35; 1973.* (3 references) (Japanese)

Specimens of commercial milk were analyzed for their organochlorine pesticide contents from March 1971 (just after the ban of these pesticides) to May 1973, using, as a rule, five specimens per month. The producing areas were Tokyo Metropolis and Prefectures of Saitama, Ibaragi, Chiba, and Gumma, all of which are located near Tokyo. The residue analyses were carried out following the FDA method. Total BHC, total DDT, and total polychlorocyclodienes averaged 0.0332, 0.0079, and 0.0063 ppm from March 1971 to Dec. 1971, and 0.0104, 0.0025, and 0.0018 ppm from Jan. to Dec. 1972. The decreasing tendency was still apparent in the results from Jan. to May 1973. On the average, the ratio of β-BHC to total BHC was high as 40-60%, that of α-BHC was 17-20%, that of γ-BHC was 6-40%, and that of δ-BHC was 1-4%. β-BHC did not show a seasonal fluctuation but β-BHC was high in autumn. The ratio of p,p'-DDE to total DDT ranged from 10-80%, that of p,p'-DDT being 20-60% and that of p,p'-DDD being 1-30%. Dieldrin was 60-100% of total polychlorocyclodienes, and the amounts of heptachlor epoxide and endrin were very small.

74-1326. Watanabe, Y.; Nakamura, H.; Higuchi, Y.; Aida, T.; Takahashi, Y.; Mimura, S. (Sec. Study of Water Quality, Dept. Environmental Health, Tokyo Metropolitan Res. Lab. of Public Health, Tokyo, Japan). **[Studies on residual synthetic detergent in vegetables and fruit, and effect on removal of residual inorganic pesticide.]** *Tokyo-Toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health) 24: 363-370; 1972.* (5 references) (Japanese)

The efficiencies of removal of pesticide, in this instance copper, from apple skin by several methods with or without using detergent (normal alkylbenzenesulfonate) were compared. The total amount of copper attached to the apple surface was calculated as the sum of copper in the washings and the copper which was dissolved into 0.1 *N* HCl after washing, determined by atomic absorption spectrometry. It was found that in the case of both shake-washing and rub-washing, the removal efficiency was better when detergent was used. The efficiency of pesticide removal was 21.7% and 44.7%, respectively, for shake-washing and rub-washing with water alone; 49.0% and 82%, respectively, for shake-washing and rub-washing with 0.2% detergent

solution. The efficiency of removal by 0.6% detergent solution was less than that by 0.2% solution, probably because the critical micelle concentration of the detergent was exceeded.

74-1327. Delchev, Kh.; Tsvetkova, Ts.; Zhecheva, G. (Vet. Inst. Inf. Parasit. Dis., Sofia, Bulgaria). **Prouchvaniya v"rkhu ostat"chnite kolichestva khlororganichni pestitsidi v zhivotinski Tl"stini. [Residual amounts of organochlorine pesticides in animal fats.]** *Vet. Med. Nauki 10(1): 9-13; 1973.* (11 references) (Bulgarian)

Three hundred and forty samples of cattle perirenal fat and 29 samples of body fat were analyzed for DDT, DDE, lindane and BHC residues. DDT, DDE, and BHC or lindane were detected in 158, 47, and 9 samples, respectively. DDT was also determined in 3 body fat samples. The DDT residue level in perirenal fat samples was on the order of 1 mg/kg, in a few cases between 1 and 4 mg/kg, and, in one case, 8 mg/kg. The organochlorine pesticide residue levels were highest in cattle raised in areas with use of such pesticides.

74-1328. Smith, A. E. (Can. Dept. Agr., Regina Res. Sta., Regina, Saskatchewan, Canada). **Degradation of dicamba in prairie soils.** *Weed Res. 13(4): 373-378; 1973.* (16 references)

Electron-capture gas chromatography was used to detect dicamba residues in three prairie soils, and the breakdown under different moisture conditions was studied. At rates equivalent to 1.1 kg/ha degradation was rapid in all soils at 25°C and at moisture levels in excess of the wilting point, with over 50% of the applied dicamba being dissipated in 2 weeks. Negligible breakdown occurred in the sterile soils over a 4-week period, indicating that microbial decomposition could be an important factor contributing to dicamba degradation. The persistence of dicamba was investigated under field conditions at three locations using small plots. Applications equivalent to 1.1 kg/ha were made in October 1971 for analysis in May 1972, and in May 1972 for analysis in August 1972. At both sampling dates no dicamba residues were detected in any of the treatments at the 0-5, 5-10 or 10-15 cm soil levels. (Author abstract by permission)

74-1329. Ritter, W. F.; Johnson, H. P.; Lovely, W. G. (Dept. Agr. Eng., Univ. Delaware, Newark, DE 19711). **Diffusion of atrazine, propachlor, and diazinon in a silt loam soil.** *Weed Sci. 21(5): 381-384; 1973.* (8 references)

The effect of soil temperature, soil moisture content, and soil bulk density on the diffusion of atrazine [2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine], propachlor (2-chloro-*N*-isopropylacetanilide), and diazinon [*O,O*-diethyl *O*-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate] in Ida silt loam soil was studied in the laboratory. Diffusion coefficients of 1.90, 1.36, and 0.63 mm^2/day at 27 C for propachlor, atrazine, and diazinon, respectively, show in a relative way the expected movement of these chemicals in Ida silt loam soil. The greatest amount of movement occurred with high temperatures and high moisture contents. Soil moisture had more effect on atrazine movement than on propachlor movement, and very little effect on diazinon movement. Movement for all chemicals decreased with an increase in bulk density. (Author abstract by permission)

74-1330. Scifres, C. J.; Allen, T. J. (Dept. Range Sci., Texas A&M Univ., College Station, TX 77843). **Dissipation of dicamba from grassland soils of Texas.** *Weed Sci. 21(5): 393-396; 1973.* (13 references)

Dicamba (3,6-dichloro-*o*-anisic acid) dissipated in 4 weeks and in 9 to 16 weeks when sprayed on grassland soils of Texas at 0.28 kg/ha and 0.56 kg/ha, respectively. At three of four locations ranging from humid to semiarid and from clay to sandy loam and sampled from 9 to 63 weeks after treatment, usually residues were no deeper than 120 cm and never deeper than 150 cm. However, dicamba residues were detected 120 cm deep 53 weeks after application of granules at 1.68 or 2.24 kg/ha to sand of semiarid grassland. Since dicamba sprays are usually applied at 0.56 kg/ha or less for grassland restoration in Texas, it is unlikely that residues of dicamba will persist in soil through the growing season from spring applications. (Author abstract by permission)

74-1331. Buchanan, G. A.; Hiltbold, A. E. (Dept. Agron. and Soils, Auburn Univ. Agr. Res. Sta., Auburn, AL 36830). **Performance and persistence of atrazine.** *Weed Sci. 21(5): 413-416; 1973.* (14 references)

Field experiments were conducted from 1967 to 1971 to determine the influence of incorporation and time of application on the performance and persistence of atrazine [2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine]. Both grass and broadleaf weeds were effectively controlled by atrazine on all dates of application. Both the 2.8 and 5.6 kg/ha rates were effective as preplant incorporated or preemergence treatments. Persistence of atrazine did not differ with respect to method of application. Applications of atrazine made in April and May were degraded more rapidly than were applications made in February and March. Loss curves generally corresponded to a first-order reaction with atrazine showing an average half-life of 20 days from February to July. (Author abstract by permission)

74-1332. Savage, K. E. (Southern Weed Sci. Res. Lab., Agr. Res. Serv., U.S. Dept. Agr., Stoneville, MS 38776). **Adsorption and degradation of chlorbromuron in soil.** *Weed Sci. 21(5): 416-420; 1973.* (17 references)

The adsorption-desorption equilibria of chlorbromuron [3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea] in soil conformed to the Freundlich equation. Values of the constants, k and n, ranged from 4.2 to 12.3 and from 1.2 to 2.5, respectively, in eight soils. No significant linear correlation was detected between the Freundlich k values and soil texture, organic-matter content, pH, or water-holding capacity. Degradation studies were conducted using ^{14}C-carbonyl-radiolabeled chlorbromuron in soil incubated at 18 or 32 C, with and without prior autoclaving, and with and without glucose enrichment. Degradation was enhanced by the higher temperature and glucose amendment, and it was retarded by autoclaving. Thin-layer chromatography indicated no accumulation of the monomethyl or monomethoxy derivative of chlorbromuron in any of the treatments. Chlorbromuron degraded rapidly in the incubation studies. Rapid loss of phytotoxicity was also noted in a greenhouse study with cucumber (*Cucumis sativus* L. 'Explorer') bioassay. Phytotoxicity from 4 ppmw chlorbromuron had diminished to a very low level after 12 weeks. (Author abstract by permission)

74-1333. Kratky, B. A.; Warren, G. F. (Univ. Hawaii, Hawaii Branch Sta., Hilo, HI 96720). **Water-soil-plant interactions with terbacil.** *Weed Sci. 21(5): 451-454; 1973.* (11 references)

The phytotoxicity of terbacil (3-*tert*-butyl-5-chloro-6-methyluracil) is not closely correlated with the amount applied, the amount in available soil solution, or the concentration in available soil solution since soil type has a pronounced effect on the levels necessary for phytotoxicity. About 19 times more terbacil was needed in a Chalmers silty clay loam (24% organic matter) than in a Bloomfield fine sand (0.3% organic matter) to cause a 30% control of sorghum (*Sorghum bicolor* (L.) Moench 'R.S. 610'). However, the Bloomfield fine sand required twice as great a concentration of terbacil in the soil solution as the Chalmers silty clay loam (0.314 μg/ml versus 0.157 μg/ml). The total adsorption of terbacil in the latter soil decreased 4.5 fold when the water:soil ratio was increased from 0.6:1 (approximately field capacity) to 32:1, but the ratio of the concentration adsorbed:concentration in the soil solution did not vary appreciably. (Author abstract by permission)

74-1334. Parochetti, J. V.; Hein, E. R. (Dept. Agron., Univ. Maryland, College Park, MD 20742). **Volatility and photodecomposition of trifluralin, benefin, and nitralin.** *Weed Sci. 21(5): 469-473; 1973.* (14 references)

Vapor losses of trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine), benefin (*N*-butyl-*N*-ethyl-α,α,α-trifluoro-2,6-*p*-toluidine), and nitralin [4-(methylsulfonyl)-2,6-dinitro-*N*,*N*-dipropylaniline] were studied under controlled laboratory conditions using a Florisil vapor trap. No nitralin vapor losses were detected at 50 C from a Lakeland loamy sand at field capacity with an air flow rate of 0.04 m^3/hr for 3 hr; whereas, 24.5% and 12.5% of trifluralin and benefin, respectively, were lost as vapors. Volatility of trifluralin and benefin increased with increasing temperatures of 30, 40, and 50 C and increasing soil moisture from air dryness to field capacity. Vapor losses from granular benefin were similar to the spray applications at 30 and 40 C. Volatilization of granular trifluralin was reduced when compared to the spray application at 40 C and 30 C but was similar for both formulations for benefin. No significant losses from photodecomposition were noted for trifluralin, benefin, or nitralin when comparing radiated and unradiated soil surface treated samples. (Author abstract by permission)

74-1335. Bode, L. E.; Day, C. L.; Gebhardt, M. R.; Goering, C. E. (U.S. Delta States Agr. Res. Cent., Stoneville, MS 38776). **Mechanism of trifluralin diffusion in silt loam soil.** *Weed Sci. 21(5): 480-484; 1973.* (14 references)

Diffusion of trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine) through Mexico silt loam soil was measured in diffusion cells under laboratory conditions. Radiolabeled herbicide was extracted from each sample and counted by liquid scintillation. Fick's Second Law with a constant diffusion coefficient adequately describes trifluralin diffusion regardless of concentration or diffusing time. Solution diffusion increases directly with bulk densities to 1.1 g/cm^3 and then decreases. Vapor diffusion is decreased approximately 50% for every 10% decrease in air-filled porosity. Vapor diffusion contributed the major portion of total diffusion at bulk densities of less than 1.2 g/cm^3. For bulk densities between 1.2 and 1.4 g/cm^3, the magnitudes of vapor and solution diffusion are similar. (Author abstract by permission)

74-1336. Bode, L. E.; Day, C. L.; Gebhardt, M. R.; Goering, C. E. (U.S. Delta States Agr. Res. Cent., Stoneville, MS 38776). **Prediction of trifluralin diffusion coefficients.** *Weed Sci. 21(5): 485-488; 1973.* (6 references)

In the range of 4.4 to 49 C, there is an exponential relationship between temperature and trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine) diffusion coefficients. Diffusion is low in air-dry soil for all temperatures. It increases to a maximum value when the soil has between 8 and 15% w/w soil moisture content and then decreases steadily as moisture content increases. When the air-filled fraction of soil void space is reduced below approximately 40% v/v by either compression or addition of moisture, diffusion begins to decrease. An equation was developed to predict trifluralin diffusion coefficients from a factorial experiment with seven soil moisture contents, five soil temperatures, and two bulk densities. Diffusion coefficients range from 3.8×10^{11} cm^2/sec to 2.8×10^{-6} cm^2/sec.

Fifteen terms are required in the prediction model to describe accurately the response surface of trifluralin diffusion coefficients. With the equation it is possible to predict trifluralin diffusion coefficients for any combination of measured soil parameters as long as they are represented by the range of the variables used in the experiment. (Author abstract by permission)

74-1337. Meikle, R. W.; Youngson, C. R.; Hedlund, R. T.; Goring, C. A. I.; Hamaker, J. W.; Addington, W. W. (The Dow Chemical Co., Ag-Organics Res. Lab., Walnut Creek, CA 94598). **Measurement and prediction of picloram disappearance rates from soil.** *Weed Sci. 21(6): 549-555; 1973.* (25 references)

We have shown by means of laboratory experiments with a wide range of soil types that the decomposition rate of picloram (4-amino-3,5,6-trichloropicolinic acid) in soil is dependent on soil temperature and moisture content and to no significant extent on organic matter, sand, silt, clay, pH, or initial concentration. A fractional order rate law (0.8) describes the disappearance rate best. It was not possible to develop a suitably precise equation for prediction of loss rate as affected by the above soil and climatic factors. Application of the Arrhenius equation to the data indicates an activation energy of 5.4 kcal/mol for the decomposition of picloram in soil, thus suggesting that the reaction is biological rather than chemical. (Author abstract by permission)

74-1338. Altom, J. D.; Stritzke, J. F. (Agron. Dept., Oklahoma State Univ., Stillwater, OK 74704). **Degradation of dicamba, picloram, and four phenoxy herbicides in soils.** *Weed Sci. 21(6): 556-560; 1973.* (36 references)

The degradation rates of 2,4-D [(2,4-dichlorophenoxy)acetic acid], dichlorprop [2-(2,4-dichlorophenoxy)propionic acid], 2,4,5-T [(2,4,5-trichlorophenoxy)acetic acid], silvex [2,(2,4,5-trichlorophenoxy)propionic acid], dicamba (3,6-dichloro-*o*-anisic acid), and picloram (4-amino-3,5,6-trichloropicolinic acid) were determined in three soils. Herbicide breakdown was proportional to herbicide concentration, so half life of the various herbicides was calculated from linear regression of the logarithm transformed residue data. The average half life for 2,4-D, dichlorprop, silvex, 2,4,5-T, dicamba, and picloram were, respectively, 4 days, 10 days, 17 days, 20 days, 25 days, and greater than 100 days. The rate of degradation of 2,4-D was the same in all three soils, but for the other herbicides it was consistently faster in soil removed from under grass vegetation than from under trees. (Author abstract by permission)

74-1339. Menges, R. M.; Tamez, S. (Res. Hort. and Agr. Res. Tech., Southern Region, Agr. Res. Serv., USDA, Weslaco, TX 78596). **Movement and persistence of bensulide and trifluralin in irrigated soil.** *Weed Sci. 22(1): 67-71; 1974.* (16 references)

Bensulide [*O,O*-diisopropyl phosphorodithioate *S*-ester with *N*-(2-mercaptoethyl)benzenesulfonamide] and trifluralin (α,α,α,-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine) were incorporated to a depth of 2.5 and 7.5 cm in sandy loam soil on the same plots in three annual applications to study the effect of incorporation depth on movement and persistence of the herbicides in furrow-irrigated soil. Bioassays and gas-liquid chromatographic assays indicated that, regardless of rainfall, both herbicides remained within the original soil zones of incorporation. Trifluralin persisted longer in soil as depth of incorporation was increased. Neither bensulide at 4.5 or 9.0 kg/ha nor trifluralin at 1.1 kg/ha persisted in appreciable amounts 12 months after treatment. At these rates, significant residues of bensulide and trifluralin were detected after 6 months only when tillage was restricted. Herbicide concentrations that persisted 6 months as determined in laboratory assays caused severe reduction in growth of field-grown sorghum [*Sorghum bicolor* (L.) Moench]. (Author abstract by permission)

74-1340. Hyzak, D. L.; Zimdahl, R. L. (Stauffer Chem. Co., P.O. Box 760, Mountain View, CA 94040). **Rate of degradation of metribuzin and two analogs in soil.** *Weed Sci. 22(1): 75-79; 1974.* (16 references)

The rates of degradation of metribuzin [4-amino-6-*tert*-butyl-3-(methylthio)-*as*-triazin-5(4H)-one], the isopropyl analog [4-amino-6-isopropyl-3-(methylthio)-*as*-triazin-5(4H)-one], and the cyclohexyl analog [4-amino-6-cyclohexyl-3-(methylthio)-*as*-triazin-5(4H)-one] in soil were determined under laboratory and field conditions. First-order kinetics best described the rate of degradation of the three herbicides. At 5 and 20°C, metribuzin and the isopropyl analog degraded more slowly than the cyclohexyl analog. At 35°C, the rates of degradation for all three herbicides were similar. The calculated half lives were approximately 329, 44, and 16 days for the three herbicides at 5, 20, and 35°C, respectively. Rates of 1.12 and 2.24 kg/ha, applied in the field, remained in the upper 5 cm of the soil profile, and the pattern of herbicide degradation followed that found in the laboratory study at 20°C. (Author abstract by permission)

74-1341. Savage, K. E.; Wauchope, R. D. (Southern Weed Sci. Lab., Agr. Res. Serv., U.S. Dept. Agr., Stoneville, MS 38776). **Fluometuron adsorption-desorption equilibria in soil.** *Weed Sci. 22(2): 106-110; 1974.* (22 references)

The adsorption-desorption equilibria of fluometuron [1,1-dimethyl-3-(α,α,α-trifluoro-*m*-tolyl)urea] were studied; a slurry technique with soil at 0-bar moisture tension was used. The equilibria established with Bosket very fine sandy loam (VFSL) were evaluated by three equations. The equation best describing

the adsorption isotherm was $x/m = K_1Ce + K_2Ce^2$. Successive equilibrations resulted in a shift in the equilibria toward the adsorbed state, most likely due to a physical change in the adsorption capacity of the soil with repeated agitation. Desorption studies with seven additional soils indicated the importance of soil organic matter content in the adsorption-desorption equilibria of fluometuron. The relationship between soil organic matter contents and the adsorption-desorption equilibrium constants was characterized by a highly significant linear correlation ($r = 0.93$) and the resulting regression equation: $K_1 = 0.46 + 0.45$(O.M.%). Clay content of these soils was not significantly correlated with fluometuron equilibrium constants. (Author abstract by permission)

74-1342. Harvey, R. G. (Dept. Agron., Univ. Wisconsin, Madison, WI 53706). **Soil adsorption and volatility of dinitroaniline herbicides.** *Weed Sci. 22(2): 120-124; 1974.* (13 references)

Studies were conducted to determine both the extent and relative strengths of adsorption of twelve dinitroaniline herbicides to a Plano silt loam soil. The effects of soil on the growth of foxtail millet [*Setaria italica* (L.) Beauv.] in vitro on agar media containing 1.0 and 0.1-μM concentrations of the various herbicides and on the relative phytotoxicities of herbicide vapors arising from the agar media to the same species were also measured. Although considerable differences in the extents and strengths of adsorption of the respective herbicides to soil were noted, correlations with herbicide performance under field conditions were low. Extrapolation of laboratory results to a Plano silt loam soil under field conditions suggests that field applications of 0.32 kg/ha of the respective herbicides might result in herbicide concentrations between 0.00062 and 0.026 ppmw in the soil solution. These concentrations appeared to be less than those necessary to produce substantial plant injury from most of the dinitroaniline herbicides. High correlations between the effects of herbicide vapors on growth of the foxtail millet under laboratory conditions and the relative effectiveness of seven of the herbicides under field conditions suggest that absorption of vapors of the dinitroaniline herbicides by plants may be more important than absorption of the herbicides from soil solutions. (Author abstract by permission)

74-1343. Heinisch, E. (Akad. der Landwirtschaftswissenschaften der DDR, Inst. fuer Pflanzenschutzforschung, Kleinmachnow, DDR). **Zur Kontamination des Bodens mit Agrochemikalien und den hieraus entstehenden Nebenwirkungen. [The contamination of the soil with agrochemicals and side effects deriving from it.]** *Wiss. Z. Tech. Univ. Dresden 22(4): 670-674; 1973.* (23 references) (German)

Pesticide persistence in the soil and translocation into plants was studied with DDT, lindane, toxaphene, polychloropinene, dicofol, simazine, atrazine, and desmetryne. Over 10% of 1,035 soil samples investigated contained more than 2 ppm DDT with a maximum of 12 ppm. Many plants grown in such soils contained DDT residues exceeding the maximum allowable content. The DDT is easily absorbed by plants from light soil types. The DDT residue level in plants usually increases during the vegetation period, and reaches especially high values in plants with high lipophilic substance content. Lindane was found in 16.3% of all soil samples. Toxaphene proved to be highly persistent in the soil with 75-80% found after 400 days. Potato bulbs investigated contained 0.3 ppm toxaphene and 0.6 ppm polychloropinene. Carrots contained 0.4-0.04 mg of dicofol per kg 141 days after treatment. Both simazine and atrazine were found much more persistent than desmetryne and prometryne. Simazine, atrazine, and prometryne were still effective for 4-4.5, 3-4, and 2.5-3 months, respectively after application of 3 kg/ha doses. Carrots treated with 2.5 kg of prometryne per ha contained 0.02-0.05 ppm prometryne; the corresponding residue content in the soil was 0.5 ppm. Seed dressing with organomercurials did not influence the mercury level in the ripe grains.

74-1344. Kanematsu, H.; Chimi, K.; Maruyama, T.; Niiya, I.; Imamura, M.; Oshiba, K.; Kawakita, H.; Matsumoto, T. (Japan Inst. of Oils & Fats, Other Foods Inspection Foundation, Tokyo, Japan). **[Reduction of organochlorine pesticide residues from crude oils and fats by processing procedures.]** *Yukagaku (J. Jap. Oil Chem. Soc.) 23(1): 49-52; 1974.* (10 references) (Japanese)

Reduction of organochlorine pesticide residues was studied in four kinds of animal and eight kinds of vegetable oils and fats imported or produced in Japan. Aldrin and endrin were not detected in any specimens. Samples containing residues > 0.1 ppm were one of pork fat (β-BHC), three of fish oils and one whale oil (p,p'-DDT, DDD, and DDT), two of beef tallow (p,p'DDE), and one lard oil (p,p'-DDD). In general, crude vegetable oils were less contaminated by organochlorine pesticide residues than crude animal oils. A high content of β-BHC was noticed only in rice bran oil. Contaminants could not be reduced by deacidifying and decolorizing processes, but were reduced by hydrogenating and deodorizing processes. Organochlorine pesticide residues were almost eliminated by these processes. Deodorizing reduced contaminants in animal oils more effectively than in vegetable oils. This was not noticed with hydrogenation.

74-1345. Ladisch, H. (Hygiene-Institut des Bezirkes Halle, Abt. Ernaehrungs- und Lebensmittelhygiene, Halle/Saale, DDR). **Ueber das Vorkommen chlororganischer Insektizide in Tabak und Tabakrauch. [Occurrence of organochlorine insecticides in tobacco**

and tobacco smoke.] *Z. Gesamte Hyg. 19(8): 579-581; 1973.* (29 references) (German)

Cigars, cigarettes, cigarillos, and cut tobacco commercially available in East Germany and produced in East Germany, West Germany, Bulgaria, Yugoslavia, Austria, the United States, Cuba, Colombia, Brazil, Japan, and Hungary, were analyzed by TLC for DDT, DDE, DDD (TDE), and lindane residues. The domestic products and those imported from European countries were practically free from pesticide residues due to the fact that DDT and lindane have been either banned or never used in tobacco plantations in those countries. Some products from overseas imports contained up to 40 ppm DDT along with DDE and DDD. Lindane was detected in amounts of 125 and 250 ppm in one Austrian and one American cigarette brand. Smoking tests revealed that 10% of the DDT residue present in the tobacco in cigarettes was found in the main stream of the tobacco smoke. Resorption of insecticide residues through the buccal mucosa and the respiratory organs is conceivable.

74-1346. Grahl, K. (Forschungsinstitut fuer Hygiene und Mikrobiologie, Bad Elster, DDR). **Zur Gewaesserkontamination durch organische Spurenstoffe. Ueber die hygienische Aussagefaehigkeit chemischer und biologischer Analysenergebnisse bei organischen Spurenstoffen mit kurzer Halbwertszeit, dargestellt am Beispiel der phosphororganischen Pestizide. [Water pollution by organic trace substances. The hygienic significance of chemical and biological-analytical results in the case of organic trace substances with short half-lives, discussed with reference to organophosphate pesticides.]** *Z. Gesamte Hyg. 19(12): 896-902; 1973.* (German)

General problems of the contamination of water bodies by organophosphorus pesticides with short half-lives and possible mechanisms of the breakdown and inactivation of such pesticides in water are discussed. Such pesticides can be broken down by hydrolysis and can be inactivated by microorganisms, especially in eutrophic waters, provided the pesticide concentrations are below the species-dependent lethal concentrations. Organophosphorus pesticides can also be decomposed by free enzymes present in the water, such as phosphatases which catalyze hydrolysis. Oxidation of thiophosphates and thionophosphates to the corresponding oxygen derivatives, oxidation of thioethers to the corresponding sulfoxides and sulfones, transformation of the C=C bonds into epoxides, hydroxylation of aromatic side chains and of *O*- and *N*-alkyl groups, reduction of nitro groups to amino groups, as well as special reactions, e.g., dehalogenation and dehydrohalogenation, are among the possible processes for breakdown of organophosphorus pesticides. The observed increase in the inactivation half-life in relatively pure, acidic, and hypotrophic waters may result in impairment of the hygienic quality of the water.

74-1347. Mel'nikov, N. N. (Author address not given). **Pestitsidy i okhrana okruzhayushchey sredy. [Pesticides and environmental protection.]** *Zh. Vses. Khim. Obshchest. 18(5): 570-576; 1973.* (72 references) (Russian)

General environmental hazards involved in the use of pesticides are illustrated by results of residue analyses, and ways of abating the hazards of environmental contamination with pesticides are presented. Dieldrin residues of 0.12-0.67 mg/kg were determined in human fat samples in countries such as Great Britain, Denmark, Australia, Canada, and the USA. The BHC, *p,p'*-DDE, and *p,p'*-DDT levels were in the respective ranges of 0.29-2.3 mg/kg, 1.7-16.1 mg/kg, and 0.32-8.2 mg/kg. The dieldrin, *p,p'*-DDE, *p,p'*-DDT, and PCB levels measured in the liver of wild birds in 1970 and 1971 were 0.01-40 mg/kg, 0.01-70 mg/kg, 0.2-260 mg/kg, and 1-600 mg/kg. A gradual increase in the mercury levels in food products paralleled the increase of mercury consumption by industries and agriculture. To decrease environmental contamination from pesticides, products with low acute toxicity and reduced persistence should be used in place of highly toxic, persistent preparations. Pesticides should not have harmful effects and should not accumulate in humans and animals. Pesticides should rapidly decompose into non-toxic metabolites.

74-1348. Harke, H. P.; Schueller, D.; Drews, C. J. (Forschungsinstitut der Zigarettenindustrie, Hamburg, Germany). **Pyrolyse von Maleinsaeurehydrazid und Hydrazin. [Pyrolysis of maleic hydrazide and hydrazine.]** *Z. Lebensm. Unters. Forsch. 153(3): 163-169; 1973.* (13 references) (German)

The pyrolysis of maleic hydrazide, an aqueous solution of maleic hydrazide diethanolamine salt (MH 30), and of hydrazine was studied by mass spectrometric and gas chromatographic methods. When pyrolyzed in a quartz tube at 900°C, hydrazine was completely decomposed, ammonia being the main product. At lower temperatures, hydrazine remained partly intact. When pyrolyzed at 900°C, maleic hydrazide formed such pyrolysis products as carbon monoxide, carbon dioxide, benzene, acrylonitrile, acetonitrile, propionitrile, toluene, cyanopropene, pyridine, cyanobutadiene, pyrrole, benzonitrile, dicyanoethylene, *o*-methylbenzonitrile, aniline, naphthalene, and quinoline, but no hydrazine. At a temperature of 650°C, 0.06% of hydrazine (relative to MH 30) was found. Smoke tests with cigarettes impregnated with hydrazine demonstrated rapid reaction of hydrazine with aldehydes to form products such as acetaldazine and acetonitrile.

74-1349. Davidek, J.; Seifert, J.; Grospicova, A. (Chemical Technical University, Prague, Czechoslovakia). **The stability of phaltan and captan in wort.** *Z. Lebensm. Unters. Forsch. 153(5): 301-304; 1973.* (23 references)

The stability of captan and folpet in wort was studied in relation to its influence on the growth of yeast by spectrophotometric and thin-layer chromatographic methods. Fungicide concentrations of 40 ppm, a stock solution of wort (malt extract dissolved with water up to a density of 17.7 Be), and a culture of *Saccharomyces cerevisae* were used in the experiments. Folpet was degraded in wort by interaction with free SH groups, resulting in a stoichiometric quantity of phthalimide. The formation of hydrochloric acid induced changes in pH. Hydrogen sulfide and carbon disulfide were not found as products of subsequent reactions. Microbiological studies confirmed the instability of these fungicides in wort. The half-lives of folpet and captan in the stock solution were 22 min and 200 min, respectively. No differences in the rate of degradation in the pH range 1 to 7 were observed. Deformation of growth curves, increased numbers of dead cells, and morphological changes due to captan were determined in *S. cerevisae*. The maximum tolerable concentration of captan for the proliferation of yeast was 10 ppm, while 20 ppm completely inhibited cell growth. The cells were more globular and smaller at captan concentrations of 0.1-10 ppm.

74-1350. Frahm, J. (Universitaet Hohenheim, Lehrstuhl fuer Phytopathologie und Pflanzenschutz, Stuttgart-Hohenheim, Germany). **Verhalten und Nebenwirkungen von Benomyl (Sammelbericht). [Behavior and side effects of benomyl (literature review).]** *Z. Pflanzenkr. Pflanzenschutz 80(7): 431-446; 1973.* (136 references) (German)

Studies on the metabolism, persistence in soil and plants, and side effects on plants and animals of benomyl and its metabolites are reviewed. Methyl-2-benzimidazole carbamate and butylisocyanate (BIC) were detected as metabolites of benomyl in aqueous solutions. The availability of benomyl in the soil is determined by the organic matter content, the clay content, and the soil pH. Benomyl and methyl-2-benzimidazole carbamate are rather stable in both soil and plants. Reduction of ozone-induced plant damage and proliferation of *Pythium* spp., *Phytophthora* spp., *Sphaeroteca fuliginea, Rhizoctonia solani, Helminthosporium vagans, Alternaria dianthi,* and other *Alternaria* species in benomyl-treated soils were observed. Side effects occur in organisms differing greatly in habits and taxonomy, e.g., earthworms, nematodes, mites, and aphids. In most cases, however, the concentrations applied in these experiments were unrealistically high. Benzimidazole derivatives were found to be mutagenic in bacteria and partially also in fungi. In experiments with benomyl in higher plants and with thiophanate methyl, a related fungicide, in mice, no mutagenic effects were observed.

See also **74-1271** **74-1272** **74-1273** **74-1278** **74-1279** **74-1352** **74-1390** **74-1427** **74-1432** **74-1459** **74-1478**

74-1351. Okudaira, M. (Dept. Pathol., School Med., Kitasato Univ., Sagamihara, Kanagawa, Japan). **Toxic hepatitis, especially on the hepatic injuries caused by acute poisonings and chronic alcoholism in Medical Examiner's cases.** *Acta Pathol. Jap. 23(3): 629-637; 1973.* (13 references)

In an investigation of toxic hepatic injuries in cases examined by the medical examiner, no specific histologic changes were observed in cases of suicide from cyanide and organic phosphorus poisoning in which death occurred within 10 min. of ingestion of the poison. Thery was some scattered spotty necrosis with marked leukocytic accumulation in organophosphorus poisoning, and scattered granulomatous spotty necrosis in the case of strychnine poisoning. Changes varied in severity and character in cases of poisoning by the same agent.

74-1352. Giovanoli-Jakubczak, T.; Berg, G. G.* (Dept. Radiation Biol. and Biophys., Univ. Rochester, Sch. Med. and Dentistry, Rochester, NY 14642). **Measurement of mercury in human hair.** *Arch. Environ. Health 28(3): 139-144; 1974.* (15 references)

Measurements of total and inorganic mercury were used to trace the history and extent of methyl mercury exposures. The experimental materials used were four samples of hair from three women, aged 25 to 30 years, who had consumed bread made from seed grain dressed with a mercurial fungicide for several months. Data on the distribution of mercury in hair was converted by a mathematical model into information about the key indices of exposure, including times of onset and termination, peak concentration in hair, and half-time of retention in blood. The model was used for computer simulations of the true distributions of mercury in hair and was validated by analyses of segments of single hairs. Conventional methods of hair sampling and fitting the resulting data to a curve were shown to introduce systematic errors underestimating peak concentrations and overestimating retention times. These errors were minimized by practical modification of the hair sampling procedures and by a new graphic method for deriving the measurements of distribution of the trace element in hair. (Author abstract by permission, supplemented)

74-1353. Switzer, B.; Lewin, V.; Wolfe, F. H. (Dept. Zool., Univ. Alberta, Edmonton, Alberta, Canada). **DDE and reproductive success in some Alberta common terns.** *Can. J. Zool. 51(10): 1081-1086; 1973.* (29 references)

A study of the relationship of DDE to reproductive success of an inland breeding population of common terns, *Sterna hirundo*, had been carried out in 1969 and 1970 at Chip Lake, Alberta. Although a continuing decrease of DDE residues in eggs had occurred, eggshell thickness remained unchanged. In addition, reproductive success markedly increased in 1970; however, the percentage of eggs suffering breakage did not change between years. Low correlations between DDE and eggshell thickness or weight in both years suggest that DDE is unrelated to these eggshell parameters, which in turn are not related to reproductive success in this population. (Author abstract by permission)

74-1354. Panel on Chemicals and Health (President's Science Advisory Committee, Off. Sci. and Technol., Exec. Off. President, Washington, DC). **Chemicals and Health.** *Science and Technology Policy Office, National Science Foundation, NSF 73-500, Washington, DC, 1973, 211 p.* (18 references)

The Panel on Chemicals and Health of the President's Science Advisory Committee has investigated established or implied threats to health posed by pharmaceuticals, agricultural chemicals, food additives, household and industrial chemicals and, to a lesser extent, other air and water pollutants. Regulation of the chemicals involved was primarily considered. Although there is an accumulation of animal toxicity data for pesticides, little is known about the direct effect of pesticides on man or the interactions of these chemicals in the environment. Although alternative controls show promise in integrated control programs, they are not necessarily free of hazards and are not expected to be substitutes for pesticides. Stimulation of research and development of practical alternatives to potentially hazardous pesticides and development of less hazardous pesticides are necessary for meeting the challenge of pest control while still being compatible with human well-being and a quality environment. It has not been shown that government regulatory agency orders to withdraw chemicals from the market have created a need for Federal compensation to industry.

74-1355. Tung, T. T. (Surgical Clinic, Fac. of Med. of Hanoi, Hanoi, North Viet Nam). **Le cancer primaire du foie au Viet-Nam. [Primary carcinoma of the liver in Viet Nam.]** *Chirurgie 99(7): 427-436; 1973.* (28 references) (French)

The abnormal increase in the occurrence of primary carcinoma of the liver in Viet Nam (26 cases per year during the 1955-1961 period against 144 cases per year in the 1961-1968 period) has been attributed to the carcinogenic effect of dioxin (2,3,7,8-tetrachlorodibenzo-*p*-dioxin), an inherent impurity in 2,4,5-T which was massively used in Viet Nam for defoliation. The LD50 of dioxin was determined as 0.5-1 μg/kg in male and female guinea pigs; 0.5-9.1 μg/kg doses were teratogenic in pregnant hamsters. The enzyme-inducing effect of dioxin was demonstrated in zoxazolamine, phenobarbital, and liver arginase tests. Laboratory diagnosis appears to be the most reliable, and early diagnosis of cancer is possible by alpha-1-fetoprotein tests in the serum, and by liver arginase, aldolase, and lactate dehydrogenase tests. The rates of reliability of the arginase and alpha-1-fetoprotein tests were 76% and

54.9%, respectively. The enzymatic disturbances appear to be the basic lesion in primary carcinoma of the liver. Early partial hepatectomy should be combined with treatment with stimulants, which may improve the survival rate. In bilateral carcinoma ligature of the hepatic artery, associated with stimulant administration, seems to prolong the survival of one third of the patients. The average age of the patients was 45 years, and the male-to-female ratio was 75% to 25%. The carcinoma was always accompanied by fatty liver, and the hepatoma was associated with cirrhosis in 52.40% of all cases. The respective incidences of hepatoma and cholangioma were 94.25% and 5.75%.

74-1356. Iwasaki, I. (2nd School of Intern. Med., Faculty of Med., Okayama Univ., Okayama, Japan). **[Intoxication caused by pesticides for agricultural uses.]** *Chiryo (J. Ther.) 56(2,3): 665-671; 1974.* (32 references) (Japanese)

Cases of acute poisoning caused by pesticides used for agriculture are described in terms of pathological physiology, clinical examinations, specific clinical symptoms, and therapy. The pesticides covered are ones heavily used in Japan such as organophosphorus, *N*-methyl-carbamates, polychloro-cyclodienes and organofluorine pesticides as well as a few specific ones, especially Blasticidin-S. The importance of identifying causal agents is described. Case history, examination of excreta, and observation of symptoms are used. Pathological physiology of the patient in several body systems and clinical examainations are the basis for therapy. Clinical symptoms are specific to the pesticide groups: pronounced miosis and fibrillary fasciculations for organophosphorus and *N*-methylcarbamates; epileptic seizures with organofluorines and organochlorines; pronounced sweating and abnormal craving for sweets for PCP; and visual field stenosis with organomercurial intoxication. The diagnosis and therapy for these specific groups of pesticides are briefly described.

74-1357. Done, A. K. (Author address not given). **That ounce of prevention.** *Emergency Med. 5(10): 284-287; 1973.*

Pesticides are some of the substances most commonly ingested by children in cases of accidental poisoning. Arsenic, in the form of ant pastes, weed killers, and snail baits, is often taken. A child between one and three years of age is most likely to ingest toxic substances in the form of household products and is surprisingly capable of getting at something he wants. Between the ages of three and five poisonings that occur often involve enticement or sharing between children. Prevention of such poisonings involves use of the least toxic products available to do the job (such as warfarin instead of strychnine), purchase of safely packaged products, avoidance of transfer of products, storage of all potential poisons in locked cabinets, and teaching the children to avoid eating what is not given to them by an adult.

74-1358. Tobin, J. S. (FMC Corp., Agr. Chem. Div., Middleport, NY). **More against pests.** *Emergency Med. 5(12): 5; 1973.*

In a Letter-to-the-Editor concerning an article on the treatment of poisoning by anticholinesterase agents changes in emphasis are suggested. The use of oximes is contraindicated in carbamate poisoning, and this point should be stressed. Since atropine is the critical treatment, little time should be wasted making a decision as to which phase of the nervous system is more strongly affected. Administration of this drug at 15 min. intervals instead of 30 min. intervals is recommended. The author of the article is in accord with some of the suggestions but feels that although too little atropine will result in death, sufficient atropine does not insure survival. Neuromuscular effects must be managed if they are present.

74-1359. Anonymous. **Emerging technology of chlorinolysis.** *Environ. Sci. Technol. 8(1): 18-19; 1974.*

Approximately 250 million pounds of chlorinated hydrocarbon byproducts, known as still bottom material, accumulate each year from organic chemical manufacturing in the U.S.; also, the armed forces have tremendous stockpiles of chlorinated hydrocarbon pesticides. Attempts to dispose of these materials by landfill, ocean dispersal, and deep-well injection have proven unsound. In the chlorinolysis process chlorine is added to the chemical residues, producing high yields of carbon tetrachloride, hydrochloric acid, and carbonyl chloride. Catalysts are not required for the high-temperature, low-pressure or high-pressure, low-temperature processes, but special reactor materials are necessary to accommodate the highly corrosive reaction products. Preliminary toxicologic tests have indicated that dioxins are not present in the reaction products. Chlorinolysis could have a positive commercial value, depending on the market situation for carbon tetrachloride. Construction of large chlorinolysis plants is under consideration.

74-1360. Egyed, M. N. (Bet Dagan, Israel). **Clinical, pathological, diagnostic and therapeutic aspects of fluoroacetate research in animals.** *Fluoride 6(3): 215-224; 1973.* (37 references)

Information on all aspects of fluoroacetamide (FAA) and fluoroacetic acid (FAC) poisoning, particularly in domestic animals, has been summarized. Poisonings in the field have resulted from ingestion of plants containing these compounds, rodenticide preparations, and carcasses of poisoned animals. LD50s range from 20-60μg/kg in dogs to 300 mg/kg in frogs, and symptoms vary from frothing around the mouth and tetanic convulsions to distinct cardiac effects. There is a latent period with both compounds, probably due to the fact that FAA must be hydrolyzed to FAC, and FAC must be converted to fluorocitric acid to produce toxic effects. Principal pathological findings in cattle and

sheep are congestion and hemorrhages in the lungs, rumen, intestines, liver, kidneys, heart, and adrenals. Low levels administered for 1 to 3 months to rats, guinea pigs, and rams have caused testicular degeneration. Laboratory diagnosis is best achieved by causing secondary poisoning in the guinea pig by injecting urine or tissue extracts from poisoned animals and measuring citric acid levels of tissues. No attempts to find an antidote for FAA poisoning have been successful. Removal of the material from the gastrointestinal tract and supportive therapy are the only measures that might be beneficial in cases of ingestion of sub-lethal doses.

74-1361. Deck, E. (Washington State Dept. Agriculture, Olympia, WA). **Regulated use of chemicals in agricultural production.** *Food Drug Cosmet. Law J. 28(10): 628-635; 1973.*

The first state laws regulating pesticides and their use were enacted in 1901; the first Federal Insecticide Act was passed in 1910. By 1972, 38 states had passed pesticide use and application legislation, and all 50 states had adopted pesticide registration laws. On October 21, 1972, the Federal Environmental Pesticide Control Act of 1972 was passed; it covers the registration, distribution, use, and disposal of pesticides in all states, including strictly intrastate distribution and use. The success with which the Act is implemented will depend on its administration by the EPA. The Act was envisioned as involving a federal-state cooperative program, a program which is in the process of being developed. Problems anticipated include meeting EPA deadlines. There will also be problems relating to the Act's provision that the use of any pesticide in a manner inconsistent with its labeling is a violation of the Act; crop losses may result if the EPA challenges the validity of state labels prior to being able to expedite federal registrations. While the recent emphasis on the effects of pesticides on the environment has resulted in a policy that persistence in pesticide use be phased out, a certain degree of persistence is necessary. While research and development of practical nonchemical means of controlling pests continues, the increasing need for food production still requires the continued use of pesticides.

74-1362. Lewin, J. F.; Norris, R. J.; Hughes, J. T. (Chem. Div., Dept. Sci. Ind. Res., Petone, N. Zealand). **Three cases of maldison (malathion) poisoning.** *Forensic Sci. 2: 101-105; 1973.* (11 references)

Three fatal suicides in which maldison (malathion) was the agent used were reported during 1970 and 1971 in New Zealand. GC analysis of the stomach contents indicated the presence of 357, 600, and 5400 mg% malathion in the three cases. The times between ingestion and death and between death and analysis were not known. In two of the cases there was evidence that the deceased had swallowed the poison and later vomited and inhaled the vomitus.

74-1363. Kodagoda, N.; Jayewardene, R. P.; Attygalle, D. (Med. Fac., Univ. of Ceylon, Colombo, Ceylon). **Case report: Poisoning with paraquat.** *Forensic Sci. 2: 107-111; 1973.* (8 references)

A 27-year-old man who had taken paraquat in a suicide attempt was treated initially by gastric lavage. In the days following poisoning, ulcerations of the mouth and throat, anuria, and icterus developed progressively. Breathing difficulties developed on the fourth day after poison ingestion, and the patient died in cardiac arrest on the fifth day. Autopsy revealed gastrointestinal tract erosions; the liver had scattered subcapsular hemorrhages. The respiratory tract mucosa was inflamed. The lungs contained numerous subpleural hemorrhages, and the cut surface was congested and hemorrhagic. Subepicardial and subendocardial hemorrhages were seen upon examination of the heart. The kidney cortex was pale and the medulla congested; a few petechiae were present in the white matter of the brain. Microscopic examination revealed congestion, hemorrhages, and cellular infiltration in all organs. Foci of early necrosis with round cell infiltration were seen in the adrenal cortex; adrenal damage by paraquat had not been reported previously.

74-1364. Oblakunov, U. (Inst. Sanit., Hyg., Occup. Dis., Tashkent, USSR). **Okislitel'no-vosstanovitel'nyye protsessy pri intoksikatsii khlor- i forsfororganicheskimi pestitsidami. [Redox processes during poisoning with organochlorine and organophosphorus pesticides.]** *Gig. Tr. Prof. Zabol. 17(6): 52-54; 1973.* (10 references) (Russian)

Redox processes occurring in the blood and urine during chronic poisoning with organochlorine and organophosphorus pesticides were studied in 88 patients admitted to a hospital for such poisonings. Changes in the cytochrome oxidase activity of the leucocytes, in peroxidase and catalase levels, and in the blood pyruvic acid level were observed in an apparently healthy group who had had occupational contact with pesticides. A significant decrease in the cytochrome oxidase level, lowering of the catalase number with increase in the catalase index, and great increases in the blood and urine pyruvic acid levels were observed in another group that was showing some symptoms of combined poisoning with organophosphorus and organochlorine pesticides. The changes in the redox processes studied were most pronounced in two other groups of patients with distinct symptoms of poisoning. The changes were most significant in the group poisoned with organochlorine pesticides. Cytochrome oxidase was the redox factor most sensitive to these pesticides.

74-1365. Khomenko, N. R.; Kazakevich, R. L. (Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Osobennosti kolennogo refleksa pri khronicheskoy intoksikatsii geksakhlortsiklogeksanom i**

tetrametiltiuramdisul'fidom. [Abnormalities of the knee reflex in chronic BHC and thiram poisoning.] *Gig. Tr. Prof. Zabol. 17(10): 56-57; 1973.* (7 references) (Russian)

The functional status of the neuromuscular apparatus was studied by electromyographic examination of the knee reflex in 25 women, 25-40 years of age, chronically exposed to BHC or thiram. A sympathetic vascular/asthenic syndrome was present in the majority of the BHC-exposed group, and in 50% of the thiram-exposed group. In the latter group these symptoms were accompanied by sympathetic-sensory polyneuritis in three patients and by toxic encephalopathy in six patients. The sympathetic-vascular form of the diencephalic syndrome was present in two cases, and one case of radiculopolyneuritis was seen in the BHC-exposed group. In the thiram-exposed group the sympathetic-vascular and asthenic syndromes were accompanied by considerable prolongation of the latency period of the knee reflex and by a pronounced increase in the amplitude of the current from the musculus quadriceps femoralis. The latency period of the knee reflex was considerably shorter in the BHC-exposed group than in the thiram-exposed group, and the duration of the current flow was much longer. Electromyography is concluded to be suitable, along with other procedures, for the differential diagnosis of poisoning by BHC and thiram.

74-1366. Lyubchenko, P. N.; Chemnyy, A. B.; Boyarchuk, Z. I.; Ginzburg, D. A.; Sukova, V. M. (M. F. Vladimirskiy Regional Clin. Inst., Moscow, USSR). **O kompleksnom deystvii na organizm cheloveka geksakhlorana i tetrametiltiuramdisul'fida. [Effects of a BHC-thiram combination in humans.]** *Gig. Tr. Prof. Zabol. 17(12): 50-52; 1973.* (14 references) (Russian)

Twenty-two female and male workers in the age bracket of 33-54 yr, with 5 to 20 yr of occupational exposure to BHC and thiram were examined for symptoms of chronic poisoning. A tendency to hyperfibrinogenemia, slight increase in the blood fibrinolytic activity, and nonspecific irritation of the fibrinogen-synthesizing reticuloendothelial elements of the liver were seen in some cases. Neurological symptoms observed included sympathetic polyneuritis of the hands, sympathetic-vascular dysfunction, asthenosympathetic and astheno-neurotic syndromes, hypothalamo-mesodiencephalic insufficiency, dysfunction of the mesodiencephalic structure, and constant depression of alpha activity. Chronic poisoning with BHC and thiram was diagnosed in 13 workers.

74-1367. Case, A. A. (School Vet. Med., Univ. Missouri, Columbia, MO 65201). **Toxicity of various chemical agents to sheep.** *J. Amer. Vet. Med. Ass. 164(3): 277-283; 1974.* (70 references)

Pesticides are among the chemicals responsible for poisonings in sheep and cattle. Sheep are particularly susceptible to copper and its compounds and may be found dead from copper or arsenic poisoning without having appeared sick. Gastroenteritis as well as other symptoms may be present with both types of intoxication. Instances of mercury poisoning have been reported due to feeding of treated seed grains. Lead is more toxic to lambs than to adults and is much less toxic than thallium, which may be lethal at 24 mg/kg and cannot be counteracted. Fluorine in the form of sodium fluoroacetate could lead to acute intoxication of sheep if it were to contaminate the ration or become available in some other way. Chlorate intoxication has occurred as a result of grazing animals several days after application of these herbicides and treatment was unrewarding. Carbofuran is a highly toxic insecticide to which sheep are likely to be exposed. With this compound atropine has been found useful in therapy.

74-1368. Leong, L.; Olson, B.; Cooper, R. (Environ. Health Sci., Univ. California, Berkeley, CA). **Methylmercury and environmental health.** *J. Environ. Health 35(5): 436-442; 1973.* (21 references)

Organic mercurials, particularly the alkyl type, are now recognized as potentially fatal toxins when released into the environment. They are not metabolized or eliminated rapidly and, unlike inorganic mercury salts, can cross the blood-brain barrier. The compounds may enter the body through inhalation, dermal absorption or ingestion. Symptoms, which include numbness in hands, feet or lips; ataxia, disturbances in speech, vision, and hearing; and emotional disturbances, may not appear for months. A standard of 10 mg/m^3 of air has been established for alkyl mercurials in work environments. Incidents of poisoning from consumption of fish containing methyl mercury in Japan have caused several countries to set limits for mercury in fish (about 1 ppm), ban fishing in certain waterways, and seize commercial catches which exceed these limits. The use of mercury seed dressings is being eliminated because of incidents of accidental consumption of treated seed and toxicity to seed-eating birds.

74-1369. Moore, E. E. (Kentucky State Dept. Health, Frankfort, KY). **Disposal of unwanted excess pesticides and empty containers.** *J. Environ. Health 36(3): 238-243; 1973.*

The present methods of disposal of pesticides and their containers, burial and incineration, minimize the immediate dangers of exposure, but have not yet been perfected for a number of chemicals. Incineration, presently the best method for disposal of large quantities of pesticides, requires expensive, specially constructed incinerators which will probably not be available to the general public in the near future unless federal or state governments subsidize their construction. Shallow burial of small quantities of pesticides usually allows little

movement of the chemical, and degradation may take place. Larger quantities present more of a hazard to underground water supplies. Ocean and deep-well disposal are being phased out as undesirable methods. Batch or continuous composting can be used to reduce organophosphate residues, but organochlorines are more resistant to this treatment. Pesticides could be reused by incorporating them in waste cellulosic materials to be applied as mulch. Chemical degradation is dangerous and practical only for industrial-sized users, while natural degradation on alkaline, sandy soil may be less hazardous. Decontamination of containers on individual farms may be done by exposing residue to detergent, water, and caustic soda and rinsing.

74-1370. Hunter, J. (Addenbrooke's Hosp., Cambridge, England). **Enzyme induction and medical treatment.** *J. Roy. Coll. Physicians 8(2): 163-174; 1974.* (71 references)

Certain foreign compounds can increase the activity of nonspecific enzymes responsible for the metabolism of most fat-soluble drugs and located within the endoplasmic reticulum of the hepatocyte. The increase in activity is accompanied by hypertrophy of the endoplasmic reticulum and an increase in the rate of drug metabolism. The phenomenon is known as enzyme induction, the effects of which are reduced drug effectiveness and/or toxicity. Co-administration of an enzyme-inducing drug such as a barbiturate and an anticoagulant such as warfarin increases the rate of metabolism of the warfarin, so that larger doses of warfarin are required to produce anticoagulation. Enzyme inducing drugs also increase corticosteroid metabolism and modify the metabolism of vitamin D. Compounds such as barbiturates, rifampicin, and organochlorine pesticides produce a dose-related increase in microsomal enzyme activity and the urinary excretion of D-glucaric acid. There is also a significant inverse correlation between glucaric acid excretion and the blood level of substances such as *p,p'*-DDE which are metabolized by microsomal enzyme systems. Although enzyme induction alters a patient's response to a drug, other factors such as genetics are more important in determining the absolute rate of drug metabolism.

74-1371. Pesticides Branch, Ministry of Agriculture, Fisheries, and Food (Ruskin Ave., Kew, Richmond, Surrey, England). **Report on the use of poisonous substances in agriculture and on the working of the agriculture (poisonous substances) regulations during 1969, 1970 and 1971.** *Ministry of Agriculture, Fisheries and Food, London, 1971, 27p.*

Annual reports of the Ministry of Agriculture deal with Agricultural (Poisonous Substances) Regulations in terms of use of scheduled substances and degree of compliance with the regulations, prosecutions, certificates of exemption, and amendments to the regulations and with publicity and advice, methods of application, storage of pesticides and disposal of containers, misapplication of pesticides, protective clothing, new proposals, and new legislation. Appendices include information on the number of contraventions and actions taken and the number of suspected and confirmed cases of poisoning. An increase in the activity of the Ministry inspectors was evident in 1971, but the number of poisonings confirmed was 29, not significantly lower than the 30 reported in the previous year.

74-1372. Norman, C. (Author address not given). **A silent summer in Washington State.** *Nature (London) 248(5444): 97; 1974.*

The U.S. Environmental Protection Agency has reluctantly approved the use of DDT for the control of Douglas fir tussock moths in 1974. Because the agency predicted a natural elimination of the infestation which did not materialize and because a decision had to be made before March 1, too early to determine the extent of virus infection of the larvae, the spraying was approved, but with certain conditions. If it appears that the population will be wiped out by the virus infection, DDT is not to be used. In the case that it is used, an unsprayed buffer strip must be maintained along streams and rivers and no spraying may be done in winds greater than 6 mph. As a condition for approval, the EPA has required that the Forest Service undertake a research effort on tussock moth control that will support registration of effective and environmentally acceptable substitutes for DDT.

74-1373. Rajendran, N. K. (Author address not given). **What is cholinesterase inhibition?** *Pesticides 7(10): 31-32; 1973.*

Organophosphate and carbamate insecticides inactivate ChE by reacting with the hydroxyl group of a vital serine moiety, causing impulses transmitted in the presence of ACh to be continuous. Symptoms of poisoning in humans include salivation, lacrimation, contraction of the pupils, uncontrolled urination and defecation, and sometimes convulsions and death. In India, carelessness is responsible for most of the occupational cases of intoxication. Storage of pesticides with food materials, improper mixing of spray solution, and working too long continuously in the field have caused many accidents. Concentrations of insecticide in the air during mixing can vary 100-fold, and measurements of exposure of the body indicate a similar difference in handling. The simple precautions of wearing proper shirts and washing with water reduce the incidence of poisoning in many areas.

74-1374. Ashworth, B. (Rentokil Labs. Ltd., Felcourt, E. Grinstead, Sussex, England). **Poisons and domestic pets.** *Vet. Rec. 90: 196; 1972.*

Prior to the introduction of warfarin, acute poisons were used as rodenticides with considerable care. While warfarin is safer than the acute poisons, it is far from safe; clients using it are therefore advised of the risks to children and animals. Since the effects of any pesticide will vary depending on the species, age, and physical condition of the animal, cases of poisoning in domestic animals must be evaluated and treated individually. A new rodenticide called Betakil is being tested experimentally. There have been a few cases of dogs eating some of this preparation; in all cases, the animal recovered fully with supportive and symptomatic therapy. A factor contributing to the relative safety of Betakil is the fact that it is used in very small quantities.

74-1375. Hilbery, A. D. R. (Vet. Hosp., William St., Windsor, Berks., England). **Poisons and domestic pets.** *Vet. Rec. 90: 196; 1972.*

A 2-year-old labrador retriever was brought to a veterinary hospital after having ingested mouse bait laid out by a local council official. The official responsible could not be contacted, but someone in a position to know stated that warfarin was the only rodent poison in use. Within 2 hr it became obvious that the dog had not been poisoned with warfarin. With great difficulty, it was discovered that the poisonous agent was alpha-chloralose. The dog recovered uneventfully with help from the Poisons Information Bureau. Veterinary clients should be warned of the dangers of pesticides via waiting-room notices.

74-1376. Bezuglyy, V. P.; Odintsova, I. L; Gorskaya, N. Z. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Morfologicheskiy sostav krovy u rabotayushchikh s kompleksom khlor- i fosfororganicheskimi pestitsidami. [Morphological composition of the blood in persons working with a complex of organochlorine and organophosphorus pesticides.]** *Vrach. Delo 11: 134-138; 1973.* (13 references) (Russian)

The morphological composition of the blood and the general health of 1,101 pest controllers exposed to pesticides such as trichlorometaphos (ronnel), trichlorfon, BHC, and DDT were investigated. The occupational exposure had lasted for less than 1 yr in 1.9%, for 1 to 5 yr in 34.6%, for 6 to 10 yr in 23.1%, for 11 to 15 yr in 18.2%, and over 15 yr in 22.2%. The ratio of male to female workers was 29.7% to 70.3%. Susceptibility to the pesticides used (headache, vomiting, vertigo, asthenia, insomnia, and epistaxis) was observed in 40.1-70.1%. Pathologic changes of the nervous system (sympatheticovascular syndrome with asthenia) were noticed in 40.7%, of the cardiovascular system (myocardial dystrophy with functional angiospasm of the coronary vessels and hypertension) in 77.1%, of the hepatobiliary system (inflammation and dyskinesia of the bile ducts and benign chronic hepatitis) in 40.7%, and of the gastrointestinal tract in 28.3% with chronic gastritis and secretory insufficiency in 9.7%. Hematological investigations revealed decreasing tendencies in the total number of erythrocytes, hemoglobin, and leucocytes, as well as distinct eosinopenia, relative lymphocytosis, and monocytopenia. The findings suggest possible development of hypochromic anemia and neutrophil leucopenia due to liver lesions, disorders of gastric secretion, and of the autonomic nervous system.

74-1377. Shipkova, L. V. (Laboratoriya gigiyeni pitaniya DIEG, USSR). **Nekotoryye pokazateli funktsional'nogo sostoyaniya organizma kolkhoznikov v svyazi s primeneniyem pestitsidov. [Some indices of functional state of the organism of collective farmers due to the use of pesticides.]** *Zdravookhr. Tadzh. 5: 12-15; 1973.* (7 references) (Russian)

Comparative biochemical investigations of the blood serum in farmers in a cotton-growing area with intense use of pesticides and in another area where no pesticides were used were run. The SGOT activity, at control level in the test group during the winter period, rose during the pesticide application in 16.3-37.5% of the males and in 16.7-33% of the females. SGPT activity increased in 2.1-7.5% of the males examined. Cholinesterase activity decreased (337-422μg/min · ml against a control value of 588 μg/min · ml in females). The total cholesterol level increased to 171-177 mg% against a control value of 147 mg%; the phospholipid level decreased to 134-156 mg% against a control value of 167 mg%; and the total protein level was slightly reduced with a decreased albumin and increased globulin fraction in a few cases.

74-1378. Israeli, R.; Mayersdorf, A. (University of the Negev/Beer-Sheva, Dept. of Occupational Med. of the Kupat Holim, Israel). **Pathologische EEG-Veraenderungen bei Arbeiten mit halogenhaltigen Insektiziden. [Pathological changes in the EEG during work with halogen-containing insecticides.]** *Zentralbl. Arbeitsmed. Arbeitsschutz 23(11): 340-343; 1973.* (7 references) (German)

Pathological changes in the EEG in 73 workers occupationally exposed to BHC, DDT, and benzilan (chlorobenzilate) were studied. Pathological changes in the EEG were detected in 16 of the 73 test persons (21.9%); one was exposed to organochlorine pesticides for 7 months, four were exposed for 1-2 yr, three for 5 yr, and another eight for 10-19 yr. Slight to medium changes of the type of diffuse sharp waves, bitemporal with alternating lateralization, and also bitemporal disorganization in the form of theta waves were observed in 11 cases within the pathological group. Medium to serious EEG changes (slow and sharp paroxysmal wave discharges, anterior spike and wave discharges, and posterior low rhythmic spike discharges) were found in four workers having been exposed to organochlorine

insecticides 1 to 2 years. The biological effect of organochlorine insecticides on the brain is supposed to be based upon the disturbance in the ammonium turnover. Pathological EEG changes were conditioned by a given insecticide residue level in the blood. No correlation between the EEG changes and the duration of the exposure was established.

74-1379. Sawinsky, A.; Durst, J. (District Hyg. Epidemiol. Station, Szolnok, Hungary). **Die Wirkung von Pestiziden auf die Aktivitaet der Phagozyten. [The effect of pesticides on the activity of phagocytes.]** *Z. Gesamte Hyg. 19(12): 863-865; 1973.* (10 references) (German)

The effect of pesticides on the activity of the phagocytes was studied by means of *Staphylococcus aureus* cultures in agricultural workers who have had contact with pesticides, especially organophosphate preparations, for 1 to 15 years. The cholinesterase activities were within normal limits. The phagocyte activity was significantly reduced in all test persons, as demonstrated by the phagocyte indices of 3.22 in a group exposed to organophosphorus pesticides for 1 to 5 years, and of 2.10 in another group that had been exposed for 5 to 15 years, against a control value of 4.80. In vitro experiments demonstrated that Ultracid (*O,O*-dimethyl-*S*-12-methoxy-1,3,4-thiadiazol-5,4H-onyl-4-methyl-dithiophosphate) also reduced the phagocyte activity in normal subjects not exposed otherwise to pesticides.

74-1380. Koester, I.; Knoke, M.; Baufeld, W.; Sauter, E. (Med. Klin. Poliklin., Ernst-Moritz-Arndt-Univ., Greifswald, DDR). **Renal-tubulaer bedingte Osteopathien. Ein Fall eines erworbenen Gluko-Amino-Phosphat-Diabetes (De Toni-Debre-Fanconi-Syndrom) beim Erwachsenen. [Osteopathies of renal-tubular origin. A case of acquired gluco-amino-phosphate diabetes (de Toni-Debre-Fanconi Syndrome) in an adult.]** *Z. Gesamte Inn. Med. Ihre Grenzgeb. 28(11): 321-327; 1973.* (31 references) (German)

Renal tubular osteopathy in an adult is usually referrable to a previous disease or injury. Possible causes include nephrotic syndromes of various origins, poisoning by nephrotoxins, and vitamin deficiencies. The osteopathies of renal tubular origin also include acquired gluco-amino-phosphate diabetes. A case of this type occurred in a 39-year-old man who had been continuously in contact with mercurial seed dressings, DNOC concentrates, and DDT for 15 years. The disease, misdiagnosed at first as chronic rheumatism of the joints, resulted in a completely bedridden condition. Treatment comprised prolonged administration of high vitamin D doses, phosphate and citrate solutions, and testosterone, as well as physical therapy. Recovery and reversal of bone changes were achieved. Renal insufficiency was not apparent in this patient at any time.

74-1381. Orth, H. (Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Braunschweig, Germany). **Zulassung und Anwendung von Pflanzenschutzmitteln im Hackfruchtbau im Rahmen der gesetzlichen Bestimmungen. [Approval and application of pesticides in root crops within the scope of the legal regulations.]** *Zucker 27(1): 27-30; 1974.* (5 references) (German)

General problems of the approval and application of pesticides in root crops and related legal regulations are described. Obligatory approval of pesticides in West Germany has been provided for by law. All approved pesticides are listed in a pesticide register in which also the mode of application, expenditure, and the necessary waiting periods are specified. Mixing pesticides with herbicides prior to application may be detrimental to plants due to the differences in their mechanisms of action and, therefore, should be avoided. The 1973 pesticides list contains benomyl and methyl thiophanate as new fungicides while the use of mercury-containing preparations is no longer permitted.

See also **74-1277** **74-1278** **74-1279** **74-1288** **74-1319** **74-1321** **74-1322** **74-1350** **74-1448**

74-1382. Wender, M.; Radecka, A. (Dept. Neurol., Med. Acad., Poznan, Poland). **Histoenzymic studies on the central nervous system in tri-ortho-cresyl phosphate poisoning.** *Acta Histochem. 17(2): 204-215; 1973.* (25 references)

Clinical symptoms of poisoning, paresis of the limbs, and eventual paralysis were observed in mice 8-14 days after administration of 4 mg/kg technical TOCP (tri-ortho-cresyl phosphate). No inhibition of different phosphatase and esterase activities or of AChE and ChE were observed in the central nervous system, either in the early or paralytic state of the intoxication. Activities of acid phosphatase, thiaminepyrophosphatase, ChE and AChE increased in the spinal cord white matter. These increases were independent of stage of illness. TOCP treatment applied during early ontogenesis did not alter the genetically determined enzymatic spectrum of the individual topic units of the central nervous system.

74-1383. Masuda, T.; Kanazawa, J. (Nat. Inst. Agr. Sci., Kita-Ku, Tokyo, Japan). **Residue of Kitazin P metabolite in rice plants and soil.** *Agr. Biol. Chem. 37(12): 2931-2932; 1973.* (5 references)

Soluble fractions of 1 kg of polished rice obtained from Kitazin P treated plants were extracted with dichloromethane, partitioned between hexane and acetonitrile, and cleaned up on an alumina column. The eluates, prepared with 10% ethyl ether in hexane, were developed on a silica gel TLC plate with 4:1 hexane-acetone. The unknown spot was scraped off and an acetone extract analyzed by GLC-MS. The compound was identified from its mass spectrum as *O,O*-diisopropyl *S*-methyl phosphorothioate (IMPT). Pot-grown rice plants treated by watering with 3-6 times the usual dose of an emulsion formula of Kitazin P contained the following Kitazin P residues at 47 days after application: grain, 0.107; straw, 140; soil (0-10 cm), 5.21; soil (10-20 cm), 0.761. Quantities of IMPT detected at the same time were: grain, 0.028; straw, 0.18; soil (0-10 cm), 0.059; and soil (10-20 cm), 0.568. Residues from granulår and purified liquid preparations were generally lower. Although the formulations used contained IMPT as an impurity, the quantities of IMPT recovered were substantially larger than those originally introduced.

74-1384. Peters, M. A. (Loma Linda Univ., Sch. Med., Dept. Physiol. Pharmacol. Biophys., Loma Linda, CA 92354). **Relative selectivity of some microsomal drug metabolizing enzyme inducers.** *Arch. Int. Pharmacodyn. Ther. 203: 30-45; 1973.* (38 references)

A study of three microsomal drug metabolizing enzyme inducers (including chlordane) demonstrated that these treatments caused an alteration in a number of microsomal and non-microsomal biochemical parameters. In addition to the typical microsomal responses, one or more of the treatments caused significant changes in the α,β-unsaturated keto reductase activity, glucose-6-phosphate dehydrogenase activity and in the qualitative and/or quantitative pattern of the electrophoresis of plasma proteins and mucoglycoproteins. Minor changes were seen in a number of other biochemical parameters following treatment, but were not statistically significant under the experimental conditions used. (Author abstract by permission)

74-1385. Akkermans, L. M. A.; Van der Zalm, J. M.; Van den Bercken, J. (Inst. Vet. Pharmacol. Toxicol., Univ. Utrecht, Biltstraat 172, Utrecht, The Netherlands). **Is aldrin-transdiol the active form of the insecticide dieldrin?** *Arch. Int. Pharmacodyn. Ther. 206(2): 363-364; 1973.* (6 references)

Dieldrin, at concentrations ranging from 10^{-5} to $5\times10^{-4}M$, caused no changes in miniature end-plate potential (m.e.p.p.) frequency, m.e.p.p. amplitude, or end-plate membrane potential in frog sciatic nerve-sartorius muscle preparations. Aldrin-transdiol, however, at 10^{-5} to $5\times10^{-5}M$ caused a rapid and marked increase in spontaneous transmitter release indicated by an increase in m.e.p.p. frequency, affected the evoked transmitter release, and caused a marked increase in endplate potential (e.p.p.) amplitude followed by a decrease of the e.p.p. In addition, it caused a suppression of the m.e.p.p. and e.p.p. amplitude and finally a complete blockade of neuromuscular transmission. The evidence strongly suggests that the dieldrin metabolite is the actual neurotoxic agent.

74-1386. Gazzard, M. F.; Sainsbury, G. L.; Swanston, D. W.; Sellers, D.; Watts, P. (Chem. Defence Establishment, Porton Down, Salisbury, Wiltshire, England). **The anticholinesterase ability of diethyl *S*-*n*-propylphosphorothiolate: errors caused by the presence of an active impurity.** *Biochem. Pharmacol. 23(3): 751-752; 1974.* (5 references)

Diethyl *S*- *n*-propyl phosphorothiolates prepared by two different routes had identical physical characteristics but different toxicity and ability to inhibit AChE. The synthesis used by Bracha and O'Brien in a study of the relationship between toxicity and anti-AChE activity produced a compound which had an apparent k_1 of 67 $M^{-1}\,sec^{-1}$ for inhibition of bovine erythrocyte AChE and an LD50 of 45 mg/kg^{-1} in mice. Another method of preparation produced a compound having a k_1 of 0.25 $M^{-1}\,sec^{-1}$ and an LD50 of 88 $mg\,kg^{-1}$. TEPP, believed to be a contaminant in the first procedure, had a k_1 of 2.3×10^4 $M^{-1}\,sec^{-1}$ and an LD50 of 1.3 $mg\,kg^{-1}$. Treatment with dilute sodium hydroxide resulted in loss of inhibitory activity in the case of the second compound, almost complete loss of activity of the first compound, and total loss of activity in the case of TEPP.

74-1387. Martin, H. de V. (Medical Div., Chem. Defence Establishment, Porton Down, Wiltshire, England).

Atropine sulphate absorption from an intramuscular injection of a mixture of the oxime, P2S, and atropine in exercising humans. *Brit. J. Pharmacol. 47(8): 619P; 1973.* (1 reference)

Previous studies showed that administration of atropine sulfate together with pralidoxime resulted in no alteration of atropine absorption in resting subjects; however, antidotes to anticholinesterase poisons would probably have to be administered to exercising subjects under practical circumstances. Effects of atropine uptake on heart rate, rectal and epigastric skin temperature, and heat loss in the current study were determined on healthy male volunteers exercising on bicyle ergometers. No significant differences were seen between the men given atropine and those given the atropine/pralidoxime mixture. All measured values were elevated in subjects receiving atropine except for mean total sweat loss which was lower. Appearance and disappearance of dryness in the mouth did not differ between subjects receiving atropine plus pralidoxime and those receiving atropine alone. The data obtained from subjects receiving pralidoxime alone were the same as those of untreated controls; pralidoxime absorption was not altered by mixing with atropine.

74-1388. Al-Hachim, G. M.; Al-Baker, A. (Institute Pharmacol., Biltstraat 172, Utrecht, The Netherlands). **Effects of chlordane on conditioned avoidance response, brain seizure threshold and open-field performance of prenatally-treated mice.** *Brit. J. Pharmacol. 49(2): 311-315; 1973.* (14 references)

Progeny of mice given chlordane at 1 or 2.5 mg/kg for 7 days during the third trimester of pregnancy made significantly fewer conditioned avoidance responses than controls when tested at the age of 30-37 days. The electroshock seizure threshold measured at 38 days was significantly elevated in young of chlordane-treated mice. Progeny of mothers receiving 2.5 mg/kg chlordane were more active in the open-field test. A dose X day interaction indicated that the response of the treated mice changed with time or experience of this test. Poor learning ability or altered motivation were evidently produced in mice from treated mothers. The changes in electroshock seizure threshold and open-field activity might have been due to the stress of the conditioned avoidance response rather than direct effects of chlordane.

74-1389. Haegele, M. A.; Tucker, R. K.; Hudson, R. H. (U.S. Bureau Sport Fish. Wildlife, Denver Wildlife Res. Cent., Denver, CO 80225). **Effects of dietary mercury and lead on eggshell thickness in mallards.** *Bull. Environ. Contam. Toxicol. 11(1): 5-11; 1974.* (22 references)

DDE in the diet of mallard ducks at a concentration of 40 ppm caused a 15% reduction in shell thickness measured on the 76th and 85th days after initiation of treatment. Mercury (granosan) and lead did not cause any significant eggshell thinning or increase in the effect of DDE. Residues of mercury in egg contents were 15 to 19 times higher than the average level found in California brown pelican eggs. Lead concentrations in bone were 30 and 100 times the average concentrations found in bones of Anacapa brown pelicans in lead-treated and lead plus DDE-treated mallards, respectively. DDE residues in egg contents were 61.6, 67.0, and 39.0 after treatment with DDE alone, lead plus DDE, and mercury plus DDE.

74-1390. Silbergeld, E. K. (Dept. Environ. Med., Johns Hopkins Univ., Baltimore, MD 21205). **Blood glucose: a sensitive indicator of environmental stress in fish.** *Bull. Environ. Contam. Toxicol. 11(1): 20-25; 1974.* (13 references)

Blood glucose determinations were used to monitor organochlorine pesticide exposure in fish. Wild populations of johnny darter showed a normal distribution of blood glucose around a mean of 37.5 mg/100 ml, and variation in samples from the same fish were less than 10%. For fish in captivity blood glucose rose from 60 mg/ml to 98.3 mg/ml after five days' exposure to 2.33 ppb dieldrin and fell to 59.5 mg/ml after 30 days' exposure. Control fish exhibited a decline in blood glucose to 46.0 mg/ml over the same period.

74-1391. Somers, J.; Moran, E. T. Jr.; Reinhart, B. S.; Stephenson, G. R. (Dept. Anim. Poultry Sci., Univ. Guelph, Guelph, Ontario, Canada). **Effect of external application of pesticides to the fertile egg on hatching success and early chick performance 1. Pre-incubation spraying with DDT and commercial mixtures of 2,4-D:picloram and 2,4-D:2,4,5-T.** *Bull. Environ. Contam. Toxicol. 11(1): 33-38; 1974.* (6 references)

Hatching success of chickens was not adversely affected by external pre-incubation application of either DDT, a mixture of 2,4-D and picloram, or a 1:1 mixture of 2,4-D and 2,4,5-T. None of the hatched chicks exhibited morphological or behavioral abnormalities, and the malformations found in dead embryos did not correlate with treatment. The post hatch growth of males was improved with treatment at the lower level of DDT and 2,4-D/2,4,5-T. No effect was observed in females. Residues of DDT, monitored at the largest dose, did not penetrate the shell in 3-5 days, but during the 14-16 day period of embryonic life, considerable amounts of the pesticide passed into the egg. Smaller amounts of 2,4-D and 2,4,5-T relative to that found on the shell passed into the egg, and the residues decreased with time.

74-1392. Friend, M.; Trainer, D. O. (Bur. Sport Fish. Wildlife, Denver Wildlife Res. Cent., Denver, CO 80225). **Response of different-age mallards to DDT.** *Bull. Environ. Contam. Toxicol. 11(1): 49-56; 1974.* (12 references)

LC50 values for DDT fed in the diet of mallard ducks for 10 days ranged from 1200 to 1600 ppm for different age classes. Greatest mortality was observed in the 5-day-old group, and adult males were more susceptible than 30-day-old ducklings. A dose-dependent mortality relationship was observed. Deaths began earliest in 5-day-old ducklings and latest in adults. Females were not as susceptible as males to DDT treatment. A reduction in mean body weights of surviving ducklings was observed in the DDT-treated 5- and 3-day-old birds. Higher residues were found in brains of mallards which died 5 to 8 days after the treated diet was discontinued than in mallards which survived for 10 days on a comparable dosage.

74-1393. Call, D. J.; Harrell, B. E. (Exp. Station Biochem. Dept., S. Dakota State Univ., Brookings, SD 57006). **Effects of dieldrin and PCB's upon the production and morphology of Japanese quail eggs.** *Bull. Environ. Contam. Toxicol. 11(1): 70-77; 1974.* (30 references)

Egg production was significantly lower in Japanese quail hens fed dieldrin at 3.1 and 50 ppm, Aroclor 1242 at 312.5 and 5000 ppm, Aroclor 1254 at 78.1 and 1250 ppm, and Aroclor 1260 at 62.5 and 1000 ppm than in controls. The higher levels of dieldrin and polychlorinated biphenyls significantly altered egg-laying patterns as influenced by photoperiod, but no effects were observed at lower doses. Those eggs examined, from hens on the low dose of dieldrin and both doses of Aroclor 1260, had significantly lower weights than the controls. Eggs were shorter and narrower than controls in the 5000 ppm Aroclor 1242 and 62.5 ppm Aroclor 1260 groups, and significant eggshell thinning was observed in all treated groups.

74-1394. Haegele, M. A.; Tucker, R. K. (Bur. Sport Fish. Wildlife, Denver Wildlife Res. Cent., Bldg. 16, Denver Fed. Cent., Denver, CO 80225). **Effects of 15 common environmental pollutants on eggshell thickness in mallards and coturnix.** *Bull. Environ. Contam. Toxicol. 11(1): 98-102; 1974.* (14 references)

Aroclor 1254, *N*-(ethylmercury)-*p*-toluene sulfonanilide (granosan), 2,4-D acid, heptachlor, and sodium arsenite were administered in single oral doses to mallards. The resulting short-term eggshell thinning was attributed to reduced food consumption. A similar effect was observed in coturnix quail after treatment with parathion, Ceresan M, Aroclor 1254, tetraethyllead, 2,4-D acid, and Sevin (carbaryl). Only *p,p*-DDE produced prolonged eggshell thinning. This effect was observed within 20 hr without the appearance of other signs of intoxication.

74-1395. Robertson, B. (Dept. Pediatric Pathol., Karolinska Sjukhuset, S-104 Stockholm, Sweden). **Paraquat poisoning as an experimental model of the idiopathic respiratory distress syndrome.** *Bull. Physio-Pathol. Resp. 9(6): 1433-1452; 1973.* (59 references)

The toxicity of paraquat in animals, as well as in plants, is probably related to its capacity to accept electrons from nucleotides and then reoxidize in the presence of molecular oxygen (particularly in the lung) with the formation of peroxides. Oxygen enhances the effect of paraquat on mammalian lung, and the antioxidant tocopherol, administered before exposure, can counteract it. A derangement of pulmonary surfactant can be demonstrated even before morphological signs of injury become apparent. Degeneration of alveolar epithelium and capillary endothelium, alveolar collapse, edema, hemorrhage and hyaline membranes induced by paraquat resemble the features of idiupathic respiratory distress syndrome (IRDS). The initial disturbance in paraquat poisoning, however, seems to be inactivation of the surfactant that surrounds the alveolar walls, while IRDS surfactant deficiency results from immaturity of the lecithin synthesis mechanisms.

74-1396. Heath, R. G.; Spann, J. W.; Hill, E. F.; Kreitzer, J. F. (Patuxent Wildlife Res. Cent., Div. Wildlife Res., Bureau Sport Fisheries Wildlife, Laurel, MD 20810). **Comparative dietary toxicities of pesticides to birds.** *Bur. Sport Fish. Wild. Spec. Sci. Rep.–Wildl. No. 152, 1972, 57p.* (21 references)

The lethal dietary toxicities of 89 pesticidal chemicals to young bobwhites, Japanese quail, ring-necked pheasants, and mallards were tested. Endrin was consistently the most toxic chemical tested, and dieldrin and aldrin were always among the six most toxic chemicals tested. In general, the organophosphate pesticides were less toxic than aldrin or dieldrin. Phosphamidon, fenthion, and Dasanit (fensulfothion) were more toxic to bobwhites; parathion and methyl parathion were more toxic to Japanese quail; and Dasanit and diazinon were more toxic to mallards. DDE was about 2.5 times as toxic as DDD (TDE) to both bobwhites and Japanese quail and almost 1.5 times as toxic to mallards. The herbicides tested were generally of a low order of toxicity with only diquat and paraquat consistently causing death. There were obvious inconsistencies in the relative sensitivities of the four species tested to the various chemicals. Death rarely occurred on the first or second days of pesticide administration. Rather, mortality tended to increase from the third through the fifth days of administration and to decrease on the sixth day (at which time pesticide administration was discontinued); deaths rarely occurred thereafter.

74-1397. Gosalvez, M.; Merchan, J. (Bioquimica Experimental, Clin. Puerta de Hierro, Universidad Autonoma, Madrid, Spain). **Induction of rat mammary adenomas with the respiratory inhibitory rotenone.** *Cancer Res. 33(11): 3047-3050; 1973.* (8 references)

An incidence of 100% mammary tumors was observed from 6 to 11 months after 42-day treatment of rats with 1.7 μg/kg rotenone. No tumors were found in controls. An incidence of 60% mammary tumors has been observed so far after 10 months in a second series of experiments. Seven of the eight tumors obtained in the first experiment were diagnosed as mammary adenomas with accentuated interstitial fibrosis and localized areas of adenocarcinomatous transformation. No liver damage or changes in the endocrine organs were noted in animals bearing tumors. The tumors seemed to be characterized by a structural mitochondrial deletion accompanied by poor mitochondrial functions and a glycolysis rate which resembled that of malignant mammary tumors. It is not known whether rotenone itself or an impurity in the product is responsible for the tumors.

74-1398. Thamavit, W.; Hiasa, Y.; Ito, N.; Bhamarapravati, N. (Dept. Pathol., Fac. Sci., Rama VI Rd., Bangkok 4, Thailand). **The inhibitory effects of α-benzene hexachloride on 3′-methyl-4-dimethylaminoazobenzene and DL-ethionine carcinogenesis in rats.** *Cancer Res. 34(2): 337-340; 1974.* (12 references)

Rats given α-BHC did not develop many hyperplastic nodules in the liver following administration of 3′-methyl-4-dimethylaminoazobenzene (3′-Me-DAB) or ethionine for 4.5-5 months, although these agents alone induced nodule formation. The frequency of nodule formation was also lower in the groups receiving α-BHC and 3′-Me-DAB or ethionine than in the group given only α-BHC. While all livers in the 3′-Me-DAB group developed hepatoma, only nonelevated whitish patches on the liver in the 3′-Me-DAB plus α-BHC animals and several yellowish nodules in the ethionine-treated animals were observed. Liver weight in the 3′-Me-DAB group was almost 5 times that in the group also given α-BHC, while liver weights in the ethionine plus α-BHC and α-BHC groups were higher than those of the basal diet or ethionine groups. Animals receiving α-BHC had lower growth rates than other animals.

74-1399. Brandt, W. N.; Flamm, W. G.; Bernheim, N. J. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **The value of hydroxyurea in assessing repair synthesis of DNA in HeLa cells.** *Chem.-Biol. Interactions 5(5): 327-339; 1972.* (25 references)

When semiconservative replication in HeLa cells was suppressed with hydroxyurea, DNA synthesis by UV-irradiated cells was almost exclusively due to repair synthesis. This observation made it possible to estimate repair replication via incorporation of (^{3}H) thymidine into DNA. Two monofunctional alkylating agents, methylmethane sulfonate and ethylmethane sulfonate, were apparently able to initiate repair synthesis in nonirradiated cells; this finding was confirmed by density gradient centrifugation. The two *N*-hydroxy compounds tested gave false positive results in the new test system. Methyl mercury hydroxide, *p,p′*-DDT, and α-chlordane failed to initiate repair synthesis. None of the compounds tested exerted a marked inhibitory effect upon repair synthesis in UV-irradiated cells.

74-1400. Hansen, L. G.; Kapoor, I. P.; Metcalf, R. L. (Dept. Entomology, Univ. Illinois, Urbana, IL). **Biochemistry of selective toxicity and biodegradability: comparative *O*-dealkylation by aquatic organisms.** *Comp. Gen. Pharmacol. 3: 339-344; 1972.* (17 references)

Various *p*-nitrophenyl ethers and DDT analogues were added to tanks containing unchlorinated well water and the following organisms placed there for 24 hr: mosquito larvae, snails, mosquitofish, and fat-head minnows. The female mosquitofish showed a greater capacity for *O*-dealkylation of the test compounds and the formation of acid-labile conjugates than the other species tested. The *p*-nitrophenyl ethers were *O*-deethylated most readily by all species, while the DDT analogues were *O*-demethylated most readily. The fish absorbed the greatest amount of pesticide within the 24-hr test period; the rate of excretion was highest in the mosquitofish and least in the minnows. The toxicity of the DDT analogues correlated well with metabolism data except in snails, which are naturally tolerant to chlorinated hydrocarbons.

74-1401. Murayama, K.; Abbott, N. J.; Narahashi, T.; Shapiro, B. I. (Dept. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC 27710). **Effects of allethrin and Condylactis toxin on the kinetics of sodium conductance of crayfish axon membranes.** *Comp. Gen. Pharmacol. 3: 391-400; 1972.* (19 references)

The effects of the insecticide allethrin and Condylactis toxin (CTX) on the kinetics of sodium conductance in the giant axon of the crayfish were studied using sucrose-gap voltage clamp techniques. Both allethrin and CTX greatly prolonged the sodium inactivation and shifted the steady-state sodium inactivation curve in the direction of hyperpolarization. However, there was a marked difference in the behavior of the sodium current in response to repolarization: in the allethrin treated axons, a residual sodium current decreased very slowly after repolarization; in the CTX treated axons, the sodium current decayed quickly. Allethrin appears to share with DDT some common mechanisms of action on sodium activation and inactivation parameters, although allethrin suppresses the sodium activation at higher concentrations. The effects of allethrin and CTX on membrane ionic conductances may be interpreted in terms of the Hodgkin-Huxley formulation.

74-1402. Odler, M. (Dept. Pharmacol., Med. Univ. South Carolina, Charleston, SC 29401). **The effect of**

some chlorinated insecticides on the activity of chorionic gonadotrophin in rats. *Comp. Gen. Pharmacol. 4(15): 293-295; 1973.* (3 references)

Administration of DDT at 5 or 10 mg/kg or heptachlor at 10 mg/kg daily for 3 days significantly reduced the increase in ovary weight produced by simultaneous administration of human chorionic gonadotrophin in prepubertal female rats. Lower doses had a similar, but smaller effect. Since DDE and heptachlor alone did not alter ovary weights or produce pathological changes, it is probable that they interact with chorionic gonadotrophin and diminish its effect on the growth of ovaries.

74-1403. Peakall, D. B.; Lincer, J. L.; Risebrough, R. W.; Pritchard, J. B.; Kinter, W. B. (Sec. Ecol. Systematics, Cornell Univ., Ithaca, NY 14850). **DDE-induced egg-shell thinning: structural and physiological effects in three species.** *Comp. Gen. Pharmacol. 4(15): 305-313; 1973.* (29 references)

DDE fed to white Pekin ducks at 40 ppm, to American kestrels at 3, 6, or 10 ppm, and to ring doves at 10 ppm significantly decreased egg-shell thickness. A decrease was observed in the thickness of eggs laid on the 2nd day, and thickness continued to decline until the 4th day for white Pekin ducks. A small decrease was observed between the 4th and 14th days. There was a significantly lower average breaking strength for eggs from treated birds than for control eggs, but the relationship between shell thickness and breaking strength appeared to be different in the two groups. The rate of water loss was lower in treated birds despite significant egg-shell thinning in all cases, and scanning electron microscope photographs indicated a reduction in the number of pores per unit area and an increase in the number of globular inclusions in shells of treated birds.

74-1404. Cooke, A. S. (The Nature Conservancy, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, England). **Response of *Rana temporaria* tadpoles to chronic doses of *p,p'*-DDT.** *Copeia 4: 647-652; 1973.* (26 references)

Development of tadpoles proceeded more slowly under exposure to 0.001 ppm DDT and more rapidly under exposure to 0.0001 ppm DDT than in control medium. Some uncoordinated, hyperactive behavior was observed in several tadpoles in the 0.001 ppm DDT group. Kinks at the base of the spine were observed in 3 of 8 tadpoles exposed to 0.0001 ppm DDT and in 3 of the 10 exposed to 0.001 ppm at the end of the experiment. After 39 days of exposure, levels of DDE and DDT were 0.08 and 0.57, respectively, in the 0.0001 ppm group and 0.21 and 3.3 ppm, respectively, in the 0.001 ppm group.

74-1405. Epstein, S. S. (Case Western Reserve Univ. Med. School, Cleveland, OH 44106). **Use of the dominant-lethal test to detect genetic activity of environmental chemicals.** *Environ. Health Perspect. 6: 23-26; 1973.* (20 references)

Both mice and rats should be used in testing for genetic activity of environmental chemicals by the dominant-lethal assay since species variation in sensitivity has been observed. DDT, for instance, induced preimplantation losses or early fetal deaths in rats, but not in mice. The route of test should reflect human exposure. Routine screening may be carried out using a modified technique in which corpora lutea counts are omitted and preimplantation losses are scored by comparing total implants in females mated with control and treated males. It is important, however, to confirm positive results with extended experiments using a number of doses.

74-1406. Rall, D. P. (Nat. Inst. Environ. Health Sci., NIH, Box 12233, Research Triangle Park, NC 27709). **Pharmacokinetic and other factors related to mutagenicity testing: quantitative analysis of the testing procedures.** *Environ. Health Perspect. 6: 67-70; 1973.* (12 references)

In designing tests for mutagenicity and analyzing the results in terms of predicting safety levels of chemicals for humans, duration of exposure must be carefully considered. Humans can accumulate compounds like DDT, which are slowly eliminated, over decades of exposure. At an exposure rate of about 0.015 to 0.04 ppm in the diet, the average U.S. citizen accumulated about the same amount of DDT in the fat over several decades as mice accumulated in one and a half years of exposure to 2 ppm DDT. Numerous other factors including the actual toxic agent, the target tissue, and variability within a species must be considered in such experiments.

74-1407. Lee, S. Y. (Div. Biol. Med. Sci., Brown Univ. and Roger Williams General Hospital, Providence, RI 02908). **Current status of the host-mediated L5178Y system for detecting chemical mutagens.** *Environ. Health Perspect. 6: 145-149; 1973.* (9 references)

The role of host metabolism in mutagenesis of environmental chemicals can be demonstrated in the host mediated assay. Both cytoxan and thio-TEPA, which are known to require metabolic activation, gave positive response in this assay. The mutant frequencies increased from 4.65 to 20.9 using MTX as selective agent and from 1.15 to 50.25 with dTR when 7.5 mg/kg thio-TEPA was administered. Cytoxan was inactive when cells were tested in vitro. There was apparently no selection against the sensitive cells by the drugs since no toxicity to target cells was observed.

74-1408. Kacew, S.; Sutherland, D. J. B.; Singhal, R. L. (Dept. Pharmacol., Fac. Med., Univ. Ottawa, Ottawa,

Canada K1N 6N5). **Biochemical changes following chronic administration of heptachlor, heptachlor epoxide and endrin to male rats.** *Environ. Physiol. Biochem. 3(5): 221-229; 1973.* (31 references)

Administration of heptachlor (3 and 15 mg/kg), heptachlor epoxide (1 and 5 mg/kg), and endrin (0.5 and 2 mg/kg) for 45 days to rats resulted in significantly lowered liver weights. Decreased body and kidney weights were observed after chronic administration of endrin at 2 mg/kg, and heptachlor at the higher dose caused reduced testicular weight. A dose-dependent increase in renal pyruvate carboxylase, phosphoenolpyruvate carboxykinase, fructose 1,6-diphosphatase, and glucose 6-phosphatase and in hepatic phosphoenolpyruvate carboxykinase and glucose 6-phosphatase was observed in heptachlor-treated animals. Heptachlor epoxide and endrin, at the higher doses, significantly increased the activities of all four key gluconeogenic enzymes in liver and kidney. The insecticides also elevated the concentration of blood glucose and urea and markedly lowered hepatic glycogen.

74-1409. Davis, G. K. (Univ. Florida, Gainesville, FL 32601). **Chlorinated hydrocarbons in nutrition and metabolism.** *Fed. Proc. Fed. Amer. Soc. Exp. Biol. 32(9): 1993-1994; 1973.* (13 references)

DDT and other organochlorines have been shown to accumulate in food and feed as a result of agricultural use and also to concentrate in animal tissue. Since, even with complete cessation of their use, the residues of these compounds will be found in food and feed for many years, effects on metabolism and nutrition should be investigated. It is possible that nutrition and metabolism studies could be affected by the presence of organochlorine residues. It has been suggested that DDT interferes with calcium metabolism, but one study showed that DDT was not responsible for reduced calcium absorption as a part of calcium metabolism in the rachitic cockerel. Females seem to be more sensitive to the chlorinated hydrocarbons than males, suggesting that the pesticides have some metabolic effects in common with estrogenic hormones.

74-1410. Brusilovskiy, Ye. S.; Fialkovskiy, A. M. (Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Eksperimental'noye izucheniye vliyaniya puti postupleniya tetrametiltiuramdisulfida v organizme na razvitiye allergicheskikh reaktsiy. [Experimental study of the effect of thiram administration on various allergic reactions.]** *Gig. Tr. Prof. Zabol. 17(10): 52-54; 1973.* (16 references) (Russian)

The effect of the administration route of thiram on the development of allergic reactions was studied in guinea pigs. Following s.c. sensitization with 0.75 mg of thiram, one group was given 6.75 mg of thiram i.v. Another group was sensitized with 0.75 mg intratracheally; groups of these animals were then given 4.5 mg of thiram intratracheally, 6.75 mg i.v., or 1 mg dermally. A third group was sensitized p.o. with 0.75 mg; some of the animals were then given 6.75 mg of thiram p.o., 6.75 mg i.v., or 1 mg dermally. The s.c.-sensitized group developed anaphylactic reactions, accompanied by the formation of humoral hapten antibodies that participated in the anaphylactic reactions. An anaphylactic reaction of moderate intensity with a pronounced asthmatic syndrome was observed in the intratracheally sensitized group following tracheal administration of a large dose of thiram, while similarly sensitized animals to which a large dose was administered i.v. showed anaphylactic reactions of low to medium intensity. Hyperemia, edema, focal hemorrhages, and circumscribed ulcerations were observed in the intratracheally sensitized animals following skin application of a large dose of thiram. No allergic reaction whatever was observed following oral sensitization.

74-1411. Lehotzky, K. (State Inst. Occup. Health, Dept. Applied Toxicol., Budapest, Hungary). **Protection by estrogenic hormone against nephrotoxicity induced by organic mercury.** *Int. Arch. Arbeitsmed. 30(3): 193-199; 1972.* (20 references)

According to a comparison with urinary sediment and histological examinations of the kidney, the urinary transaminase (GOT and GPT) level seemed to represent a suitable index of the slight renal tubular injury induced in rats by subacute organic mercury poisoning. The source of the urinary transaminase appears to be the detached tubular epithelial cells; it is independent of the serum transaminase level. Estrogenic hormone treatment was unable to protect against MEMC toxicity in acute poisoning tests, probably because of the rapid onset of renal failure and death. Treatment with estrogenic hormone was able to prevent the tubular injury caused by subacute MEMC poisoning. The mode of action has not yet been elucidated, but may involve promotion of SH-compound synthesis, direct protection of the kidney, or hepatic enzyme induction.

74-1412. Van Alfen, N. K.; Kosuge, T.* (Dept. Plant Pathol., Univ. California, Davis, CA 95616). **Microbial metabolism of the fungicide 2,6-dichloro-4-nitroaniline.** *J. Agr. Food Chem. 22(2): 221-224; 1974.* (18 references)

Escherichia coli B, *Pseudomonas cepacia,* and an unidentified bacterium were examined for their capacity to metabolize the fungicide 2,6-dichloro-4-nitroaniline (DCNA) in liquid culture using [^{14}C]DCNA. *E. coli* B and *P. cepacia* both converted DCNA to 2,6-dichloro-*p*-phenylenediamine (DCPD) and 4-amino-3,5-dichloroacetanilide (ADCAA). Culture fluids of the unknown bacterium incubated with [^{14}C]DCNA yielded ADCAA but no detectable amounts of DCPD. The organisms differed in their capacity to produce these metabolites. *Pseudomonas cepacia* completely metabolized DCNA

within 48 hr, and accumulated ADCAA in the culturalfluid as the major metabolite. Similarly, ADCAA was the major DCNA metabolite accumulated by the unknown bacterium. *E. coli* B rapidly utilized DCNA but accumulated DCPD as the major DCNA metabolite. Conditions of low aeration favored conversion of DCNA to DCPD and ADCAA. At least four other unidentified DCNA metabolites were produced by the bacteria. (Author abstract reprinted by permission of the American Chemical Society)

74-1413. Sikka, H. C.; Lynch, R. S.; Lindenberger, M. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Uptake and metabolism of dichlobenil by emersed aquatic plants.** *J. Agr. Food Chem. 22(2): 230-233; 1974.* (11 references)

[^{14}C]Nitrile-labeled 2,6-dichlorobenzonitrile (dichlobenil) was readily absorbed by the roots of the emersed aquatic plants, alligator weed (*Alternanthera philoxeroides*) and parrot feather (*Myriophyllum brasilense*) and was translocated to the shoots. The concentration of the ^{14}C was greater in parrot feather than in alligator weed 24 hr after treatment. The roots of the alligator weed contained a considerably greater amount of ^{14}C than the shoots, whereas in parrot feather, a major portion of the absorbed ^{14}C was present in the shoot. [^{14}C]Dichlobenil leaked from the roots of alligator weed but not from those of parrot feather. Alligator weed was not able to metabolize dichlobenil; on the contrary, parrot feather transformed the herbicide into several metabolites. The major metabolite resulting from the transformation was 3-hydroxy-2,6-dichlorobenzonitrile; small amounts of 2,6-dichlorobenzamide and 2,6-dichlorobenzoic acid were also present. A significant amount of radioactivity (14-18% of ^{14}C in the shoot) was present as highly polar, unknown metabolites. The tolerance of parrot feather to dichlobenil appears to be related to its ability to metabolize the herbicide. (Author abstract reprinted by permission of the American Chemical Society)

74-1414. Whitten, C. J.; Bull, D. L. (Cotton Insects Res. Lab., Agr. Res. Serv., U.S. Dept. Agr., College Station, TX 77840). **Fate of 3,3-dimethyl-1-(methylthio)-2-butanone *O*-(methylcarbamoyl)oxime (Diamond Shamrock DS-15647) in cotton plants and soil.** *J. Agr. Food Chem. 22(2): 234-238; 1974.* (17 references)

In field-grown cotton plants, the carbamate pesticide Diamond Shamrock DS-15647 (3,3-dimethyl-1-(methylthio)-2-butanone *O*-(methylcarbamoyl)oxime) was rapidly oxidized to its toxic sulfoxide derivative, which was further oxidized, but more slowly, to the more toxic sulfone form. Degradation of the toxic forms occurred primarily by conversion to unidentified water-soluble products. In soil the chemical changes of DS-15647 were similar to those found in plants, but they proceeded at slower rates. Cotton seeds that had been surface treated with DS-15647 and planted in the greenhouse absorbed 20% of the dose after 1 day. The sulfoxide and sulfone derivatives were the primary products recovered from plants grown from the treated seeds. In tests with several species of insects, DS-15647 applied topically was more effective than the sulfoxide or sulfone derivatives. The sulfone form was the most potent anticholinesterase agent. (Author abstract reprinted by permission of the American Chemical Society)

74-1415. Feung, C. S.; Mumma, R. O.*; Hamilton, R. H. (Dept. of Entomol., Pesticide Res. Lab., Pennsylvania State Univ., University Park, PA 16802). **Metabolism of 2,4-dichlorophenoxyacetic acid. VI. Biological properties of amino acid conjugates.** *J. Agr. Food Chem. 22(2): 307-309; 1974.* (21 references)

Twenty amino acid conjugates of 2,4-dichlorophenoxyacetic acid (2,4-D) were synthesized and evaluated for their ability to stimulate cell division and elongation. All the conjugates stimulated *Avena* elongation at an optimum concentration of 10^{-5}-10^{-6} *M* and were nearly equivalent to 2,4-D at its optimum of 10^{-6} *M*. These conjugates also stimulated growth of soybean callus tissue at an optimum concentration of 10^{-6}-10^{-7} *M*. The growth resulting from the addition of many of these conjugates exceeded the growth stimulation produced by 2,4-D at its optimum of 10^{-7} *M*. Elongation and growth were inhibited when higher concentrations of the conjugates were used. All of these properties are typical of auxins and the reported metabolism of 2,4-D to conjugates Glu, Asp, Ala, Val, Leu, Phe, and Trp cannot be considered as a detoxification mechanism. (Author abstract reprinted by permission of the American Chemical Society)

74-1416. Chang, F.; Stephenson, G. R.; Bandeen, J. D. (Dept. Environ. Biol. and Crop Sci., Univ. of Guelph, Guelph, Ontario, Canada). **Effects of *N,N*-diallyl-2,2-dichloroacetamide on ethyl *N,N*-di-*n*-propylthiocarbamate uptake and metabolism by corn seedlings.** *J. Agr. Food Chem. 22(2): 245-248; 1974.* (8 references)

In nutrient solution culture *N,N*-diallyl-2,2-dichloroacetamide (R-25788) at a concentration of 10^{-5} *M* protected corn from injury by EPTC (ethyl *N,N*-di-*n*-propylthiocarbamate) at rates ranging from 5×10^{-5} to 10^{-4} *M*. R-25788 did not reduce EPTC uptake or alter EPTC distribution in the plants. Extracts from plants treated with [^{14}C]EPTC plus R-25788 contained less unaltered EPTC than plants which received no R-25788. In R-25788 plus [^{14}C]EPTC treated corn seedlings more $^{14}CO_2$ and [^{14}C]EPTC vapors were released than from seedlings treated with [^{14}C]EPTC alone. While these effects of R-25788 on EPTC metabolism and elimination from the plants could contribute to the reduction in EPTC injury, their magnitude did not seem adequate to explain the full mode of action of R-25788

as an EPTC antidote. (Author abstract reprinted by permission of the American Chemical Society)

74-1417. Krueger, H. R.; Mason, J. F. (Dept. Entomol., Ohio Agr. Res. and Develop. Cent., Wooster, OH 44691). **Effects of plant growth regulators on levels of phorate and aldicarb in soybeans.** *J. Agr. Food Chem. 22(2): 338-339; 1974.* (5 references)

A series of (45) plant growth regulators was applied to the foliage of soybeans in combination with a soil drench of the systemic insecticides phorate and aldicarb. No significant differences were found in the uptake or degradative metabolism of either insecticide due to the individual plant growth regulators. Typical residues determined in soybean leaves were: aldicarb (10 days posttreatment) 50-150 ppm, (20 days posttreatment) 35-143 ppm; phorate (3 days posttreatment) 24-113 ppm, (10 days posttreatment) 70-257 ppm, and (20 days posttreatment) 81-265 ppm. Aldicarb residues primarily included aldicarb, aldicarb sulfoxide, and aldicarb sulfone; phorate residues comprised phorate and five oxidation products. (Author abstract, supplemented, reprinted by permission of the American Chemical Society)

74-1418. Goswami, K. P.; Green, R. E.* (Agron. and Soil Sci. Dept., Univ. Hawaii, Honolulu, HI 96822). **Ametryne metabolite in transpired/guttated water from sugarcane shoot.** *J. Agr. Food Chem. 22(2): 340-342; 1974.* (15 references)

An unknown ^{14}C metabolite was found in the collected water from sugarcane grown in soil or nutrient solution treated with ametryne (ring-^{14}C). This metabolite was not $^{14}CO_2$ or bicarbonate, but was polar, basic, and water soluble. Plants were periodically enclosed in divided air-tight chambers separating soil/root and shoot to allow collection of $^{14}CO_2$ and the transpired/guttated water. $^{14}CO_2$ evolved from the shoot was minor relative to both $^{14}CO_2$ from soil/root and the unknown metabolite from the shoot. (Author abstract reprinted by permission of the American Chemical Society)

74-1419. Davey, R. J.; Johnson, L. A. (U. S. Department of Agriculture, Beltsville, MD 20705). **Tissue residues, blood chemistry and physiological response of lindane-treated swine.** *J. Anim. Sci. 38(2): 318-324; 1974.* (12 references)

Tissue residues, blood chemistry, and physiological response of pigs were measured after three treatments with lindane: spraying at 6-wk intervals with 0.05% lindane solution; feeding at a rate of 2 mg/kg/day; or feeding at 40 mg/kg/day for 40 days. Blood levels of the pesticide were below the limit of quantitation except in the case of animals treated with 40 mg/kg/day. In these animals a peak blood level of 0.63 ppm was observed after 13 weeks. Backfat samples from control and spray-treated animals, taken during the experiment, contained not more than 4 ppm lindane, and those from animals fed 40 mg/kg/day reached a maximum of 260 ppm after 27 to 33 weeks. Highest levels in brain, kidney, liver, and muscle obtained at the end of the trials were also found in the 40 mg/kg group. Serum creatinine, cholesterol, protein, albumin, and alkaline and acid phosphatase did not change consistently due to lindane exposure. Plasma isoleucine was elevated in the 2-mg/kg group, and taurine, tyrosine and ornithine were higher in the 40-mg/kg group. No conclusive results were obtained from the study of reproductive success.

74-1420. Miyata, M.; Imai, H.; Ishikawa, S. (Dept. Ophthalmol., School Med., Kitasato Univ., Sagamiharashi, Kanagawa, 228, Japan). **Electroretinographic study of the rat after fenthion intoxication.** *Jap. J. Ophthalmol. 17: 335-343; 1973.* (28 references)

Fenthion, at doses below 0.5 mg/kg, induced changes in the ERG (electroretinogram) of rats treated with pentobarbital. The changes included a shortening in the latency time of the a-wave and in the peak times of the a- and b-waves and an increase in the amplitude of the waves. At doses higher than 25 mg/kg, the latency times and peak times of the a- and b-waves and the oscillatory potentials were prolonged, and the amplitude of the a-and b-waves decreased. A dose-related decrease in AChE activity was observed in the retina and cerebellum of animals treated with levels of fenthion > 0.5 mg/kg. Subnormal ERGs were recorded when AChE values were $< 50\%$ of control values, while supernormal ERGs were observed with $> 50\%$ AChE activity. As little as 0.005 mg/kg fenthion caused changes in the ERG.

74-1421. Duke, T. W. (Gulf Breeze Environ. Lab., Gulf Breeze, FL). **Criteria for determining importance and effects of pesticides on the marine environment: a brief overview.** *J. Mar. Technol. Soc. 8(8): 21-22; 1974.* (4 references)

Assessment of the effects of a candidate pesticide on the marine environment begins with an acute bioassay using selected test organisms. Information obtained aids the researcher in designing chronic tests, which are usually conducted through a reproductive cycle or through some stage of development. Mortality is no longer considered an adequate assessment of effect, and oxygen evolution (by phytoplankton), changes in growth rate, respiration rate, shell deposition, blood protein configuration, inhibition of enzymes, and pathological changes are measured. Organisms which are known to be susceptible to the group of compounds to be tested should be chosen and be in good condition. Quantitative information on rates, routes, and reservoirs of accumulation can be obtained from experimental ecosystems, which can be constructed without sophisticated equipment. Residue analyses in areas of application give additional insight on the effect of the pesticide.

74-1422. Kacew, S.; Singhal, R. L. (Dept. Pharmacol., Univ. Ottawa, Faculty Med., Ottawa, Ontario, Canada). **Effect of certain halogenated hydrocarbon insecticides on cyclic adenosine 3′,5′-monophosphate-^{3}H formation by rat kidney cortex.** *J. Pharmacol. Exp. Ther. 188(1): 265-276; 1974.* (46 references)

Incubation of rat renal cortex and liver slices with *p,p′*-DDT in concentrations of at least 10^{-7} *M* markedly enhanced the formation of cyclic adenosine 3′,5′-monophosphate (cyclic AMP) from tritiated adenosine, while incubation of kidney cortex homogenates with *p,p′*-DDT (10^{-6} *M*) greatly increased the activity of adenyl cyclase. In male Wistar rats a single oral dose of *p,p′*-DDT (600 mg/kg) significantly elevated the endogenous levels of cyclic AMP in the kidney cortex, enhanced the activities of basal- and fluoride-stimulated adenyl cyclase, and slightly decreased the activity of renal phosphodiesterase. The in vitro formation of cyclic AMP from tritiated adenosine was also elevated by other organochlorine pesticides and caffeine; the latter potentiated the action of *p,p′*-DDT on cyclic AMP synthesis. Imidazole, propranolol, and hydrazine inhibited the *p,p′*-stimulated increase in the formation of cyclic AMP within the kidney cortex. Similarly, the effect of the pesticide on cyclic AMP formation was inhibited by prostaglandin E_1 and $F_2\alpha$. The data indicate that the *p,p′*-DDT induced changes in the carbohydrate metabolism of kidney cortex and liver tissues may be associated with the effect of the pesticide on the synthesis of cyclic AMP.

74-1423. Koleshko, O. I.; Andreyev, A. S. (Belorussian State Univ., USSR). **Vliyaniye fosfororganicheskikh insektitsidov na pochvennuyu mikrofloru v rizosfere khmelya i na urozhay khmelya-syrtsa. [Effect of organophosphate insecticides on the soil microflora of hop rhizospheres and on the hops yield.]** *Khim. Sel. Khoz. 11(11): 839-840; 1973.* (Russian)

The effects of amiphos (DAEP), rogor (dimethoate), and antio (formothion), used at expenditures of 2 and 3 g per plant, were studied on the soil microflora of hop rhizospheres and on hops yield. Ammonifying bacteria were inhibited and the ammonifying capacity of the soil reduced by all three pesticides during the first few days after application. The bactericidal power of the pesticides rapidly decreased and microorganism counts normalized within one month. All three insecticides were suitable for quantitative control of plant louse one month after application.

74-1424. Bezuglov, V. G.; Minenko, A. K.; Shelestov, Ye. P. (Sci. Res. Inst. Agr. of the Central Regions of the Chernozem Belt, USSR). **Vliyaniye dikamby, tordona 22K i lyumetona na sornyaki i pochvennuyu mikrofloru. [Effects of dicamba, Tordon 22-K, and lumeton on weeds and soil microflora.]** *Khim. Sel. Khoz. 11(11): 854-856; 1973.* (Russian)

The effects of dicamba, tordon 22-K (picloram), and lumeton on the soil microflora in barley fields were studied. The effects of these herbicides on the soil microflora were determined primarily by the soil moisture content. In soils with a moisture content equaling 150% of the normal value, all three herbicides stimulated the microflora growth. Dicamba and tordon 22-K, used at expenditures of 0.12 kg/ha and 0.07 kg/ha, increased the count of phosphate mineralizing bacteria by 84% and 52%, respectively. The corresponding increases in the fungal count were 80% and 56%. These preparations practically did not affect Actinomycetes and microorganisms consuming mineral nitrogen. In soils with a moisture content equaling 80% of the normal value, the pesticides slightly inhibited the soil microorganisms, especially mineral nitrogen-consuming microorganisms, nitrifying bacteria, and denitrifying bacteria.

74-1425. Malichenko, S. M. (Inst. Plant Physiol., Acad. Sci. Ukr. SSR, USSR). **Vpliv sim-triaziniv na mikrofloru gruntu. [Effect of sym-triazines on soil microflora.]** *Mikrobiol. Zh. (Kiev) 33(6): 734-735; 1971.* (Ukrainian)

The effects of 2 to 10 kg/ha doses of atrazine, triazine, and prometryne on the soil microflora were studied. Both the normal doses of 2 kg/ha and the increased doses of 10 kg/ha had little effect on the soil microflora and the soil microbiological processes in both chernozem and in podzolized soil. Fungi were the most sensitive to triazines, especially in chernozem. Actinomycetes cultures isolated from simazine- and atrazine-treated soils utilized carbon and nitrogen present in these substances.

74-1426. Ulasevich, Ye. Y.; Drach, Yu. O. (Ukr. Acad. Agr. Sci., USSR). **Vpliv atrazinu na azotfiksuychi bakterii v siromu opidzolenomu grunti ta rizosferi kukurudzi. [Effect of atrazine on nitrogen fixing bacteria in gray podzolized soil and corn rhizosphere.]** *Mikrobiol. Zh. (Kiev) 33(6): 735-736; 1971.* (Ukrainian)

The effects of 2 kg/ha doses of atrazine were studied on the soil microflora and soil microbiological processes in gray podzolized soil and in corn rhizosphere. The numbers of oligonitrophilic bacteria in the corn rhizosphere were reduced, especially during flowering, and a similar reduction in gray podzolized soil with high moisture content was observed. Atrazine also caused shifts in the species distribution of oligonitrophilic bacteria in both types of soil. During the first 20 days after application atrazine reduced the number of *Clostridium pasteurianum*, and then stimulated growth of this species in gray podzolized soil. In the corn rhizosphere, atrazine stimulated the growth of Azotobacter after its first application, but depressed it after the second application. After the first application, atrazine increased the dehydrogenase activity in both types of

soil, but acted similarly on the dehydrogenase activity in gray podzolized soil without plants only after a second application.

74-1427. Benezet, H. J.; Matsumura, F. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Isomerization of γ-BHC to α-BHC in the environment.** *Nature (London) 243(5408): 480-481; 1973.* (10 references)

To study the fate of γ-BHC in the environment, highly purified γ-BHC was incubated with aquatic sediments under simulated natural conditions and with a soil microorganism under laboratory conditions. The nonradioactive γ-BHC used contained 0.0017% of impurity calculated as α-BHC. The aquatic sediments were taken from a 10-foot depth at Pearl Harbor, Hawaii. After addition of BHC to the sediment bottles, the bottles were filled with seawater, returned to the bottom at the collection site, and kept there for 30 days. The results of the gas chromatographic analysis indicated that the α-BHC content increased drastically, amounting to approximately 50 times the amount initially present. In the laboratory study, a 48-hr-old culture of *Pseudomonas putida* in a mannitol base medium was incubated with γ-BHC for 4 weeks, with and without addition of NAD. Another principal metabolite accompanying α-BHC was γ-BTC (tetrachlorocyclohexane); 3% and 19% of α-BHC and γ-BTC were formed respectively.

74-1428. Tsirkov, Y. (Author address not given). **Vilyanie na kheptakhlora i lindana vurkhu pochvenata mikroflora. [Effects of heptachlor and lindane on the soil microflora.]** *Nauch. Tr. Vissh. Selskostop. Inst. (Vasil Kolarov) Plovdiv (Sofia) 19(4): 121-126; 1970.* (5 references) (Bulgarian)

The effect of 2-10 g/kg doses of lindane and heptachlor on the soil microorganisms was studied. The growth of the soil bacteria, determined on peptone broth agar, was strongly suppressed by both preparations during the 180-days test. While heptachlor strongly inhibited Actinomycetes, lindane stimulated the growth of Actinomycetes after 40 days. Neither heptachlor nor lindane had any noticeable effect on the growth of fungi.

74-1429. Yamada, S. (Kyoto Univ., Sch. Med., Japan). **[Urinary 6-beta-hydroxycortisol. II. Urinary 6-beta-hydroxycortisol in different diseases and after administration of drugs.]** *Nippon Naibumpi Gakkai Zasshi (Jap. J. Endocrinol.) 49: 844-864; 1973.* (40 references) (Japanese)

Various experiments were conducted to study the increase of 6-beta-hydroxycortisol in urine. It was ascertained that an increase is induced by the Cushing syndrome, by the terminal phase of pregnancy, and by administration of ACTH or of *o,p'*-DDD. A 14-year-old girl with cancer of the right suprarenal gland was given a total of 120 g of *o,p'*-DDD. The measurements of 6-beta-OH-F were taken 17 days after the initial administration of *o,p'*DDD, and 14 days after surgical removal of the suprarenal gland. Urine cortisol (F), the total free 17-OHCS in urine, urine THF+THE, urine tetrahydrodesoxycortisol (THS), 6-beta-OH-F extracted by ethyl acetate, and the total urine 17-OHCS were measured. After the administration of *o,p'*DDD, the amount of 6-beta-OH-F in urine drastically increased and THF+THE decreased. The total urine 17-OHCS increased, but more than half of this was attributed to the increased amount of 6-beta-OH-F. The total THF+THE+THS decreased to 5500 micrograms/24 hr. Cortisol was about 468 micrograms/24 hr before the administration, and increased to 711 micrograms/24 hr after the administration of *o,p'*DDD. This means that *o,p'*DDD could not inhibit the progress of the cancer cells.

74-1430. Niu, M. (Showa Univ., Tokyo, Japan). **[Pharmacological activities of norbormide.]** *Nippon Yakurigaku Zasshi (Jap. J. Pharmacol.) 66: 224-236; 1970.* (6 references) (Japanese)

The acute toxicity of norbormide and its effects on the circulatory system were examined by experiments on mice, dogs, rabbits, and five types of rats (Long-Evans, Donryu, Buffalo, Wistar, and Norway). The toxicity was particularly strong on Norway rats, LD50 being 5-10 mg/kg, while it was 7-30 mg/kg on Donryu and Wistar. The histopathological observations on rats showed hemorrhages, swelling, and congestion of the heart, lungs, liver, kidneys, spleen, stomach, and intestines, and swelling of blood vessels. The blood pressure was increased, presumably due to the drug's direct effect on the peripheral vein muscles. The coronary arteries of rabbits and rats were constricted by norbormide. However, toxicity was scarcely noted on rabbits, mice, and dogs. One g/kg of norbormide did not induce death or any symptoms. When 1.1-2.3 g/kg was given to groups of mice with 0.2 g/kg differences, one out of six died in 1.3 g, 1.9, and 2.3 g/kg groups for male, and 1.1g, 1.5g and 2.3 g/kg groups in female mice; two in the 1.5/kg group for the male and three in 1.9 g/kg group for the female mice died. LD50 for rabbits, mice, and dogs were all judged to be more than 1g/kg. Norbormide seemed to decrease blood pressure of dogs and rabbits.

74-1431. Sato, T.; Yoshida, S.; Ogura, Y.; Moroi, K. (Chiba Univ., Japan). **[Effect of ethyl-*p*-nitrophenyl phenylphosphonothioate (EPN) on tryptophan pyrrolase activity in relation to miosis and change in serum cholinesterase activities.]** *Nippon Yakurigaku Zasshi (Jap. J. Pharmacol.) 66: 387-393; 1970.* (21 references) (Japanese)

The changes in serum cholinesterase activities and miosis induced by ethyl-*p*-nitrophenyl phenylphosphonothioate (EPN) were observed for studies on the

effects of organophosphate on tryptophan pyrrolase activity. Mature male Wistar rats were used. EPN was orally administered, suspended in 80% propylene glycol. The control group was given 0.1 ml/100 g of 80% PPG solution. Other types of rats used in the experiments were alloxan diabetic rats and rats with suprarenal glands extracted. The measurements of miosis were taken by special microscale. ChE activity was measured by the Hesterin method and remaining ACh was measured by $FeCl_3$ colorimetry. TP activities were measured by calculating kynurenin quantity in liver enzyme. The serum ChE activity decreased among the EPN 15 mg/kg treatment group about 35% in one hour, 45% in 6 hr, and continued to decrease 24 hr later. The group given 7.5 mg/kg recovered the ChE activities to the original level in 24 hr. Miosis began one hour after the administration, and pupils shrank about 40% in 3 hr. The condition continued for about 3 hr more but pupils recovered to the original size in 24 hr. Pretreatment of rats with PAM (pralidoxime) or atropine clearly inhibited the TP activity increase induced by the single administration of EPN. The inhibition of serum ChE activity preceded the increase of TP activity and miosis. Alloxan diabetic rat's TP activity increase by EPN is attenuated. The EPN induced increases of TP activities are clearly inhibited by atropine, PAM, DCI, propranolol, and the extraction of suprarenal glands. From the above observations, it was concluded that the TP activity was increased by EPN's function as a stressor and by acceleration of glucocorticoid secretion from pituitary-suprarenal activities.

74-1432. Bruchhausen, V. von; Stiasni, M. (C. H. Boehringer Sohn, Wiss. Abt. Biochem., 6507 Ingelheim am Rhein, Germany). **Transport of the systemic fungicide Cela W 524 (triforine) in barley plants. II. Uptake and metabolism.** *Pestic. Sci. 4(6): 767-773; 1973.* (8 references)

After soil drench application of triforine (5 mg) to 35 barley plants in pots, a maximum of 7.5 μg a.i./g shoots (fresh weight) was found on the second day. The biological (effective) half-life was 9 to 10 days. Doses of 50 mg resulted in impaired absorption rather than increased foliar concentration. On day 8 piperazine comprised 20% of the radioactivity of the four metabolites found in the shoots. An additional metabolite appears solely in the soil. (Author abstract by permission)

74-1433. Rickett, F. E.; Tyszkiewicz, K. (Wellcome Res. Lab., Berkhamsted, Herts., England). **Pyrethrum dermatitis. II. The allergenicity of pyrethrum oleoresin and its cross-reactions with the saline extract of pyrethrum flowers.** *Pestic. Sci. 4(6): 801-810; 1973.* (27 references)

Tests on sensitized guinea pigs have indicated that crude pyrethrum oleoresin contains two types of allergens. The more potent are compounds with similar allergenic determinants to the allergens present in the 0.9% saline extract of pyrethrum flowers which have been tentatively classified as glycoproteins or glycopeptides with molecular weights distributed between about 60,000 and 200,000. The second class of allergens is the sesquiterpene lactones, principally pyrethrosin but these are of minor importance due to their low concentration in pyrethrum oleoresin. Contrary to a recent report, no allergenic activity was obtained from pyrethrin II. (Author abstract by permission)

74-1434. Hance, R. J. (Agr. Res. Counc. Weed Res. Organ., Begbroke Hill, Yarnton, Oxford OX5 1PF, England). **The effect of nutrients on the decomposition of the herbicides atrazine and linuron incubated with soil.** *Pestic. Sci. 4(6): 817-822; 1973.* (11 references)

The rates of disappearance of atrazine and linuron when incubated at 22°C with soil or soil containing added nutrient materials were determined with 2 contrasting soils. Inorganic salts, straw or a combination of both increased atrazine degradation in both soils. None of the treatments influenced linuron breakdown greatly. It is concluded that in these soils the rate limiting step in atrazine degradation could be microbiological, not chemical. (Author abstract by permission)

74-1435. Hermann, G.; Kolbe, W. (Pflanzenschutz Anwendungstechnik, Biol. Forschung, Farbenfabriken Bayer AG, Leverkusen, Germany). **Effect of seed coating with Mesurol for protection of seed and sprouting maize against bird damage, with consideration to varietal tolerance and side-effects.** *Pflanzenschutz-Nachr. 24(2): 279-320; 1971.* (120 references)

Mesurol (methiocarb) has been found effective in repelling birds and many other pests of maize. When properly used to coat maize seed, it does not remain as a residue on crops. At a concentration of 300 ppm in the diet of rats, methiocarb did not cause behavioral or histologic changes. Most pigeons tolerated doses of 150 and 200 mg/kg and at least half of the pheasants treated at 300 and 350 mg/kg survived. Since there is minimal leaching with this chemical and it hydrolyzes in water, there should be no hazard to fish.

74-1436. Crowe, M. W. (Dept. Vet. Sci., Univ. Kentucky, Lexington, KY). **A study of the teratogenic capability to tobacco (*Nicotiana tobacum*) and those chemicals commonly applied to the growing plant.** *Proceedings of the Tobacco and Health Workshop Conference No. 4, Lexington, Kentucky, March 1973, pp. 198-202.* (4 references)

The teratogenic properties of tobacco in swine were associated with a natural component of the plant rather than with chemicals normally applied to tobacco. Feeding a commercial mixed insecticide containing TDE, DDT, and dieldrin, or a product containing 30% maleic hydrazide or commercial "Black Leaf 40" failed to

produce the malformations usually observed when pregnant swine ingested tobacco stalks between days 10 and 40 of gestation. Aqueous leaf extracts of tobacco fed at a rate of 16 and 32 mg/kg nicotine did produce arthrogrypotic newborn pigs.

74-1437. Wedig, J. H.; Gay, V. L. (Olin Res. Cent., New Haven, CT 06504). **Can increased hepatic estrogen metabolism interfere with ovulation in the rat? Effects of chronic phenobarbital or chlordane treatment.** *Proc. Soc. Exp. Biol. Med. 144(3): 796-801; 1973.* (33 references)

Administration of phenobarbital (37 mg/kg) or chlordane (25 mg/kg) intraperitoneally to adult female rats from 3 to 14 days caused a 10-fold increase in microsomal enzyme activity as indicated by a rise in hydroxylation of acetanilide. In these rats, chlordane treatment, but not phenobarbital treatment, lowered the number of rats ovulating. Since the behavior of microsomal enzymes and release of luteinizing hormone (LH) were the same in both groups, the mechanism of inhibition of ovulation is not clear. Phenobarbital or chlordane treatment did not alter the rate of disappearance of LH and follicle stimulating hormone (FSH) from the serum following hypophysectomy in previously ovariectomized rats. Induction of ovulation by pregnant mare's serum gonadotrophin in immature rats or preovulatory increase of serum LH during induction were not altered by pretreatment with phenobarbital at 37 mg/kg or chlordane at 12.5 mg/kg for 4 days.

74-1438. Jones, M. M.; Harbison, R. D. (Dept. Chem., Vanderbilt Med. Cent., Nashville, TN). **Phthalyltetrathioacetic acid (PTTA) a new mercury chelating agent.** *Res. Commun. Chem. Pathol. Pharmacol. 7(2): 389-398; 1974.* (12 references)

Phthalyltetrathioacetic acid (PTTA), at 250 mg/kg, reduced the lethality of methyl mercury to mice 50% when the dose was 50 mg/kg (orally) and 95% when the dose was 30 mg/kg. Injection of aqueous solutions of PTTA in mice at near lethal doses, which were much higher than lethal doses of currently used chelating agents, did not produce tetany. The compound appears to be highly specific for methylmercury and potential treatment for organomercurial poisoning.

74-1439. Maki, S. (Author address not given). **[Pesticides and their toxicity (ammonium sulfamate).]** *Ringyo To Yakuzai (Forest. Forest Chem.) 44: 11-14; 1973.* (6 references) (Japanese)

Toxic and residual properties of ammonium sulfamate used mainly for destroying weeds in forestry were studied. Acute oral toxicity tests of ammonium sulfamate determined LD50 values as 3900, 5760, and 3000 mg/kg, respectively to rat, mouse, and quail; s.c. LD50 value to mouse is 1438 mg/kg. TLm (48 hr) to young carp is 1000-2000 ppm (no deaths at 500 ppm). Dermal toxicity determined on shaven skin of mice was very small; dose rates lower than 20000 ppm/kg did not produce symptoms, even if repeatedly applied. Abnormalities of body weight or other conditions were not noticed in quails after 14 days of continued administration of ammonium sulfamate mixed with diet at the rate of 150 and 590 mg/kg/day. The fertility of quail was not affected by two periods of 10 days continuous administration of mixed feed containing ammonium sulfamate at the rate of 150 mg/kg/day, with an interval of 25 days of ordinary diet. Rats fed with mixed daily diet containing it at the rate of 1% to the feed for 105 days showed no clinical symptoms nor pathohistological findings at autopsy. It has been reported that ammonium sulfamate does not affect the soil microorganisms. In general, its persistence in soil is 3-6 months.

74-1440. Hayakawa, M. (Nissan Chem. Ind. Co., Ltd. Tokyo, Japan). **[On the weed-removing herbicides Yamaclean-A Microgranule, Yamaclean-D Microgranule, and Yamaclean-M Concentrate.]** *Ringyo To Yakuzai (Forest. Forest Chem.) 46: 14-18; 1973.* (Japanese)

These three herbicides have been introduced for weed removal in forestry to replace Brushkiller, which contains 2,4,5-T as the active ingredient. Yamaclean A contains 6.0% of butyl 2-methyl-4-chlorophenoxyacetate (MCPA butyl ester) and 10.0% of ammonium sulfamate; Yamaclean D contains 6.0% of butyl 2-methyl-4-chlorophenoxyacetate and 5.0% of sodium 2,2-dichloropropionate (dalapon-Na); and Yamaclean M contains 60.0% of butyl 2-methyl-4-chlorophenoxyacetate. The acute oral LD50 of butyl 2-methyl-4-chlorophenoxyacetate is 1182 and 914 mg/kg, respectively, for the male ICR mouse and male Wistar rat at 169 hr after administration. When a 6% solution of the ester in olive oil was painted daily for seven days on the skin of rats, no remarkable change was observed; however, histologically a slight infiltration by lymphocytes was observed. After feeding ICR mice and Wistar rats the ester for 90 consecutive days, the maximum no-effect dose was 19.67-20.22 and 8.42-11.47 mg/kg, respectively. The toxicity to young carp was TLm48, 1.98 ppm. The acute oral LD50 of sodium dichloropropionate is 9330 mg/kg in the male rat and 4600 mg/kg in the female mouse. When the salt was given to dogs beginning at 50 and ending at 1000 mg/kg/day for 80 days, no abnormality was found. When it was given for a year at the rate of 50 mg/kg/day no abnormality was found, and at the rate of 100 mg/kg/day slight hypertrophy of the kidney was noticed. Rats fed for two years at the rate of 15 mg/kg/day showed no anomalies, and those fed at the rate of 50 mg/kg/day showed slight hypertrophy of the kidney. The toxicity of the salt to young carp, TLm48, was 270 ppm. Ammonium sulfamate is far less toxic, the acute oral LD50 to rat being 3900 and to mouse, 5760 mg/kg. When 25 and 50% aqueous solutions of this compound were repeatedly

painted on rat skin, no symptoms were shown. The toxicity of the sulfamate to young carp, TLm48, is greater than 10,000 ppm. The half-life of butyl 2-methyl-4-chlorophenoxyacetate in paddy fields is less than 10 days. The half-life of sodium dichloropropionate in soil is about 20 days.

74-1441. Kawai, M. (School of Hygiene, Tokyo Dental College, Tokyo, Japan). **[Inhalation toxicity of phosgene and trichloronitromethane (chloropicrin).]** *Sangyo Igaku (Ind. Med.) 15(4): 406-407; 1973.* (6 references) (Japanese)

Toxicity of chloropicrin was studied using two types of formulation, an aerosol and a gas. Male dd-strain mice were exposed to chloropicrin aerosol generated from a nebulizer into which a predetermined amount of diethylene glycol solution and a stream of air were charged at respective rates of 6.5-7.6 ml/hr and 5 l/min. for 4 hr. The LC50 was calculated from the morbidity of mice within 10 days of inhalation. The concentration of chloropicrin was not measured but was calculated. The exposure was carried out at 16-18°C. For the gaseous form, a predetermined amount of chloropicrin was evaporated in a chamber and mice were placed in the chamber for 30 min. The LC50 was calculated as before. The temperature in the chamber was 20-26°C. The LC50 for aerosol inhalation was 66.0 mg/m^3 at 4 hrs and the LC50 for gas inhalation was 370 mg/m^3 for 30 min.; these were calculated to yield LCt50 of 15840 mg/m^3-min. and 11000 mg/m^3-min., respectively. Death is presumably due to anoxia complicated by pulmonary edema or pneumonia according to the autopsy findings and pathohistological examination.

74-1442. Yamada, A. (Sect. Hyg. Chem., Osaka Municip. Res. Lab. Pub. Health, Osaka, Japan). **[Malformations in chick embryos due to organophosphorus pesticides, especially malformation of the cervical spine due to parathion.]** *Seikatsu Eisei (J. Urban Living Health Ass.) 17(5): 144-150; 1973.* (33 references) (Japanese)

Various formulations of the organophosphorus pesticides parathion, methyl parathion, fenitrothion, dimethoate, dichlorvos, EPN, malathion, Kitazin P, phencapton, estox, diazinon, mecarbam, and menazon were injected into the white of a chicken egg. Prior to injection the eggs had been incubated for 96 hr at 38°C, RH 55-62%; pesticides were injected at 1, 5, 10, or 20 mg of formulation per egg. The embryos were examined for malformations after 12 days of incubation. The mortality rate increased in a dose-dependent manner within 11 days of incubation; parathion, methyl parathion, dichlorvos, EPN, Kitazin P, and diazinon gave mortalities over 50%. The rate of malformations was more than 51% for parathion, estox, and diazinon in the embryos on the 11th day of incubation. The malformations were most commonly found in the cervical spine, e.g., torticollis and short neck; other common malformations were short abdomen, generalized edema, and parrot beak in the parathion group. Vertebral fusion was demonstrated by alizarin red staining, along with micromelia and parrot beak in the estox group, and micromelia, torticollis, and parrot beak in the diazinon group. The major malformations induced by menazon, which gave a 21-50% malformation rate, were micromelia and parrot beak. Of 159 untreated control eggs, 148 survived to the 11th day of incubation with only two cases of malformation. There was no difference in the frequency of malformation between chemically pure parathion and the parathion formulations. When parathion was injected later than the ninth day of incubation, no malformations of the cervical spine were observed. In the case of cervical spine malformations, ossification was delayed on the 12th-13th day and fusion occurred on the 16th-18th day of incubation. Conspicuous biochemical changes were observed during the development of malformations due to parathion.

74-1443. Spiridonov, Yu. Ya.; Spirodonova, G. S. (All-Union Inst. Plant Pathol., Moscow Oblast, USSR). **Effect of long-term use of sym-triazines on the biological activity of the soil.** *Sov. Soil Sci. 5(2): 162-171; 1973.* (23 references)

English translation; for an abstract of the original Russian article, *Agrokhimiya* 3: 122-131; 1973, see abstract no. 73-2435.

74-1444. Moore, J. A. (Nat. Inst. Environ. Health Sci., NIH, Research Triangle Park, NC). **Characterization and interpretation of kidney anomalies associated with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD).** *Teratology 7(3): A-24; 1973.*

A dose response relationship has been defined for kidney anomalies in pups from mice treated with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Frequency of occurrence, unilateral or bilateral involvement, and severity of lesion were recorded. Pups examined postnatally had a lower frequency of anomalies than those taken at day 20 of gestation, suggesting that kidney aberrations are reversible. Cystic hydronephrosis appeared to be the type of malformation produced.

74-1445. Helweg, A. (Statens Planteavls-Laboratorium, Bakteriologisk afdeling, Denmark). **Undersogelser over fungicidet benomyl i jord. I. Stabilitet og biologisk nedbrydning. [Persistence of benomyl in different soil types and microbial breakdown of the fungicide in soil and agar culture.]** *Tidsskr. Planteavl. 77(2): 232-243; 1973.* (10 references) (Danish)

The persistence and the microbial breakdown of benomyl were studied in different soil types and in agar cultures. After addition of benomyl to the soil, the only fungistatic compound that could be extracted even a few

hours later was the breakdown product, methyl 2-benzimidazole carbamic acid (MBC). A study of the fungistatic effect of extracts from untreated, autoclaved, and irradiated soils, incubated at 25 C, using a *Penicillium* sp., showed that the decrease in the fungistatic activity is related to microbial activity. After 52 days incubation, extracts from the untreated soil still had about 50% of the original fungistatic activity; the activity in extracts from autoclaved and irradiated soils was 80% of the original. The fungicide concentration decreased faster in humus-rich soils than in those containing little humus (2.9 and 0.6%). The fungistatic effect in extracts from soils with 10.2%, 2.9%, and 0.6% humus content, determined after six months incubation, was below 10%, about 30%, and about 75% of the original activity. Bacteria and fungi were grown on a mineral agar with soil extract and 400 ppm benomyl as a source of carbon and nitrogen. Addition of the insoluble fungicide made the agar very cloudy, and the growth of the organisms resulted in clearance of the cloudy agar. The fungistatic effect was almost removed in the clear zones where the bacteria were growing.

74-1446. Maki, A. W.; Stewart, K. W.; Silvey, J. K. G. (Dept. Biol., North Texas State Univ., Denton, TX 76203). **The effects of dibrom on respiratory activity of the stonefly, *Hydroperla crosbyi*, hellgrammite, *Corydalus cornutus* and the golden shiner, *Notemigonus crysoleucas*.** *Trans. Amer. Fish. Soc. 102(4): 806-815; 1973.* (34 references)

The effects of sublethal concentrations of Dibrom (naled) on the respiratory activity of the stonefly (*Hydroperla crosbyi*), hellgrammite (*Corydalus cornutus*), and golden shiner (*Notemigonus crysoleucas*) were studied. The pesticide was significantly more toxic to the stoneflies and hellgrammites under flowing water conditions than under static conditions; the toxic effect of the pesticide on the golden shiners was not significantly greater under static conditions. Sublethal concentrations of naled significantly affected the oxygen consumption of all test animals and reduced their tolerance to low oxygen tensions. The ability of the golden shiners to tolerate low oxygen tensions was reduced 50% by exposure to 5 ppm naled, while stonefly body undulations and hellgrammite gill beats were increased by exposure to sublethal toxicant levels under flowing conditions.

74-1447. Kawatski, J. A. (Dept. Biol., Viterbo Coll., La Crosse, WI 54601). **Acute toxicities of antimycin A, Bayer 73, and TFM to the ostracod *Cypretta kawatai*.** *Trans. Amer. Fish. Soc. 102(4): 829-831; 1973.* (12 references)

Ten to 20 organisms of the ostracod species, *Cypretta kawatai*, were maintained in water-filled chambers to which antimycin A, Bayer 73, TFM, or mixtures of TFM and Bayer 73 had been added as acetone solutions. After 96 hr, the LC50 of antimycin A (7.4 μg/l.) was 95.5%, while that of TFM (7.1 mg/l) was 95.7% and that of Bayer 73 (1.16 mg/l) was 70%. The toxicity of a 50:50 mixture of TFM and Bayer 73 was simply additive, while that of a 98:2 mixture was slightly synergistic. The results indicate that the three toxicants would have no significant immediate effect on *C. kawatai* when employed at normal field concentrations for short periods of time. However, material loss of the ostracods would occur if the toxicants were to persist in their environment at application concentrations for more than 48 hr.

74-1448. Shim, J. C.; Self, L. S. (Nat. Inst. Health, Seoul, Korea). **Toxicity of agricultural chemicals to larvivorous fish in Korean rice fields.** *Trop. Med. 15(3): 123-130; 1973.* (2 references)

Aplocheilus latipes and *Zacco platypus*, shown to be consumers of mosquito larvae, exhibited LC50 values ranging from 0.14 ppm to 9.7 ppm for Dursban (chlorpyrifos), fenthion, fenitrothion, naled, methyl parathion, phenthoate, EPN, malathion, lindane, DDT, dieldrin, and PCP. *Z. platypus* was more resistant to the chemicals than *A. latipes*, and both species were resistant to trichlorfon and 2,4-D. Fenitrothion and fenthion, at rates twice those recommended for second stem borers, caused negligible mortality in field tests, and malathion appeared to pose little toxic hazard. EPN, PCP and phenthoate were very toxic to caged *A. latipes* at recommended application rates. Lindane was less toxic, and 2,4-D caused negligible mortality at the recommended rate. The results suggest that PCP, which is used in larger quantities than other chemicals, should be replaced by more selective materials in order to help increase fish populations in rice field areas where integrated vector control is desired.

74-1449. Logvinenko, V. F. (Acad. Sci. Ukr. SSR, Inst. Molecular Biol. Genetics, Kiev, USSR). **O mutagennykh svoystvakh granozana. [On mutagenic properties of granosan.]** *Tsitol. Genet. 7(4): 321-324; 1973.* (4 references) (Russian)

The mutagenic properties of granosan used as a seed dressing agent were studied in wheat plants and sprouts. Granosan was used at expenditures of 2 kg/ton of seeds, as well as in doses equaling 4, 10, 25, 50, and 75 times the expenditure above. Growth of sprouts was inhibited and related with the increase in the expenditure. Morphological changes (tumor-like thickenings in some parts), similar to those evoked by polyploidogenic substances such as colchicine, were observed in plants grown from granosan-treated seeds. Frequency of chromosomal aberrations in primary rootlets of the sprouts increased.

74-1450. Zharykaw, I. S.; Nikalaenka, G. V.; Litvyak, U. S. (Belorussian Sci. Res. Inst. Vet., USSR). **Neka-**

toryya biyakhimichnyya pakazchyki kryvi maladnyaku rahatay zhyvely pry praral'nym uvyadzenni khlarafosu. [Biochemical indices of the blood of young cattle following oral administration of trichlorfon.] *Vestsi Akad. Navuk Belarus. SSR. Ser. Sel'skagaspad. Navuk 2: 105-109; 1973.* (7 references) (Belorussian)

Some biochemical indices of the blood of young cattle were studied for up to 6 days following oral administration of 1 ml of trichlorfon (90% active agent) per kg of body weight. After the first administration the blood sugar level was elevated, the inorganic phoshate content was reduced, the serum protein level was increased, and the cholinesterase activity was reduced 25%. After the second administration of trichlorfon the serum protein level decreased and the cholinesterase activity was reduced 50%.

74-1451. Zhavoronkov, N. I.; Antsiferov, S. D. (All-Union Sci. Res. Inst. Exp. Vet., USSR). **Vliyaniye tetrametiltiuramdisul'fida na organizm kur. [Effects of tetramethylthiuram disulfide on chickens.]** *Veterinariya (Moscow) 8: 92-93; 1972.* (Russian)

The chronic effect of 1/100 and 1/200 LD50 doses of tetramethylthiuramdisulfide (thiram) on egg laying, hatching, and embryonal and postembryonal development was studied in chickens. Treatment with 1/100 LD50 of thiram totally suppressed egg-laying. In another group thiram fed at 1/200 LD50 daily, the egg-laying gradually decreased from 69.6% during the first month of the treatment to 19% during the third month, as compared with the control group. Following a total intake equaling 0.20 LD50 or 168 mg/kg, increased infertility of the eggs (34.2%), a hatching rate of 50%, reduced hatching weight, and considerable slowdown of the postembryonal development as compared with a control group were determined. The malformations of the extremities, observed in 11.3% of the test embryos, indicate the teratogenic effect of thriam.

74-1452. Mukhamedshin, R. A. (All-Union Sci. Res. Inst. Avian Pathol., USSR). **Patologomorfologicheskiye izmeneniya u kur pri otravlenii alkilsevinom 68/76. [Pathological and morphological changes in chickens during poisoning with alkylsevin 68/76.]** *Veterinariya (Moscow) 8: 93-95; 1972.* (Russian)

Six-months-old chickens were given alkylsevin 68/76 orally at LD100 and LD50 doses (1,200 and 625 mg/kg) to determine histomorphological and pathological organ changes. The minimum dose producing histological changes was 400 mg/kg. Tachypnea, motor dysco-ordination, paresis, and paralysis which were observed following poisoning reflect the cholinomimetic action of alkylsevin 68/76. Diffuse hemorrhages and ulcers in the cuticle of the gizzard and the intestinal mucosa; hepatomegaly; hemorrhages and necrosis in the liver, kidney, lung, adrenal gland, and brain; hyperemia of the pulmonary vessels and adrenal glands; and anemia of the spleen were determined in morphological investigations. Histological and histochemical investigations revealed venous stasis and the presence of eosinophilic protein exudates in the intercellular spaces and partial necrosis of the hepatocytes in the liver. Vitamin C and glycogen were lacking in the hepatocytes. Elastic and collagen fibers had degenerated in the walls of the central veins; plethora and wall degeneration of the spleen arteries were seen, with diapedesis of the hematocytes. Kidney abnormalities included granular dystrophy, necrosis and absence of acid mucopolysaccharides and nucleic acids. Degeneration of the vascular walls and vacuolization of the endothelium were seen in the lung. Necrotic acinar cells appeared in the pancreas. Hyperplasia of the ependymal cells, thickening and homogenization of the vascular walls with intense methylophilic lymphoid-histiocyte infiltration and hydropic dystrophy of the pyramidal cells were seen in the brain, and hyperemia and hemorrhage in the parenchyma with reduced cytoplasmic lipid levels in the adrenal gland.

74-1453. Zhavoronkov, N. I.; Akulov, A. V.; Antsiferov, S. D.; Verkhovskiy, A. P.; Yevdokimov, S. M. (All-Union Inst. Exp. Vet., USSR). **Vliyaniye karbamatov na organizm kur. [Effect of carbamates on hens.]** *Veterinariya (Moscow) 8: 114-116; 1973.* (Russian)

The effects of triallate, TMTD (thiram), zineb, and carbaryl on the health of hens, egg laying, and embryonal and postembryonal development were studied in 10-day and 90-day feeding tests. Daily administration of 1/100 LD50 doses of TMTD suppressed egg laying in six days. The other pesticides, fed to the hens in identical doses for 10 days, failed to reduce egg production. During administration of 1/200 LD50 doses of these pesticides for 90 days, egg production in the TMTD-treated group was reduced. No noteworthy changes in the blood serum protein content, or residues of triallate, zineb, and carbaryl in the organs, tissues, and eggs of treated hens were found. Embryonal lethality increased, postembryonal viability decreased, and postembryonal development was retarded in all groups. Teratogenesis in embryos from the TMTD-treated group was determined. Pathoanatomic and histological investigations revealed necrosis, hemorrhages, edema, focal hyperemia, focal pseudoeosinophil infiltration of the cortical layers, intense atresia and fibrosis of the follicles in the ovaries, and catarrhal inflammation of the mucosa in the oviduct in hens treated with triallate or TMTD.

74-1454. Mukhamedshin, R. A. (All-Union Sci. Res. Inst. Avian Pathol., USSR). **Patomorfologiya pri otravlenii kur dibromom. [Pathomorphology during dibrom poisoning of hens.]** *Veterinariya (Moscow) 8: 116-117; 1973.* (Russian)

The general toxicity of and pathomorphological changes produced by 1 to 300 mg/kg doses of dibrom

(naled) were studied in acute poisoning tests in hens. Dibrom doses of 100, 150, and 300 mg/kg killed all hens within 30-60 min, while 50 mg/kg caused 33% mortality during the same period. Hens poisoned with 1 mg/kg dose of dibrom survived. The poisoning symptoms observed (sialorrhae, lachrymation, bronchial spasm, areflexia, and muscular tremor and convulsions) are indicative of the cholinomimetic action of dibrom. Circulatory disorders, hemorrhages in the subcutaneous tissue and internal organs, and focal necrosis in the liver were observed. Dibrom doses of 50 mg/kg caused destructive changes in the internal organs and the brain; reduction of the DNA, RNA, and vitamin C levels in the parenchymatous organs; lipoid and hydropic dystrophy of the hepatocytes; and methylophilic neuroplasma of the cerebral ganglion cells. Cytoplasmal inclusions in the cerebral neurons and intranuclear inclusions in some hepatocytes due to 100 mg/kg doses were observed. Histological and histochemical changes were produced by 1 mg/kg doses and when the preparation was applied on the skin and feathers in doses of 1.3-2.6 mg/kg.

74-1455. Lapushkov, A. G. (Ryazan Inst. Agr.,Ryazan, USSR). **Lecheniye zhivotnykh pri otravlenii khlorofosom. [Treatment of trichlorfon poisoning in animals.]** *Veterinariya (Moscow) 11: 96-97; 1973.* (Russian)

The therapeutic efficiency of atropine, tropacine, phospholytine, dipyroxime, and their combinations in the treatment of acute poisoning of mice, guinea pigs, rabbits, and calves was studied. Trichlorfon was administered s.c. in its respective LD100 doses (600, 700, and 180 mg/kg) to albino mice, guinea pigs, and rabbits. While the control animals died from asphyxiation and paralysis of the central nervous system within 1 to 3 hr, 80-83% of the animals treated with combinations of atropine with dipyroxime or of phospholytine with dipyroxime survived. The mixture of tropacine with dipyroxime proved to be most effective. Calves poisoned with the LD100 dose of trichlorfon were administered i.m. 2 mg/kg doses of tropacine with mg/kg doses of dipyroxime. The antidote effect appeared in 3-4 min with suppression of bronchial spasm, sialorrhea, and tremor of the skeletal muscles and normalization of the respiration. The administration of camphor, potassium chloride, and ascorbic acid is also effective in addition to the antidotes.

74-1456. Kentikyan, M. L. (Yerevan Vet. Inst., Yerevan, USSR). **Otsenka produktov uboya pri otravleniye khlorofosom. [Examination of meat products for trichlorfon residues.]** *Veterinariya (Moscow) 11: 100-101; 1973.* (Russian)

Trichlorfon residue dynamics were studied in organs and tissues of sheep and rams. In addition, trichlorfon residues in lamb meat were investigated in relation to the doses fed to the animals and the time elapsed from poisoning until slaughtering. Trichlorfon was rapidly incorporated in organs and tissues after feeding of 50, 100, 200, and 300 mg of trichlorfon per kg of body weight. The trichlorfon residues were highest in the kidney, brain, blood, omentum, and lungs, and lowest in the spinal cord, muscles, liver, and tongue. Residues of trichlorfon were completely eliminated 6, 10, 16, and 22 days after poisoning in animals fed single 50, 100, 200, and 300 mg/kg doses of trichlorfon, respectively.

74-1457. Talanov, G. A.; Leshchev, V. V.; Ternovoy, V. I.; Mikhaylenko, V. K. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Ostatki khlorofosa v organakh i tkanyakh ovets. [Detection of trichlorfon in tissues and organs of sheep.]** *Veterinariya (Moscow) 12: 99-100; 1973.* (Russian)

The elimination of trichlorfon residues from the organs and tissues of sheep previously treated with 30 mg of trichlorfon per kg of body weight (equaling 1.2 g of 8% aqueous solution in the form of nasal spray) was studied. The trichlorfon residues measured in the heart, lungs, liver, kidney, muscles, and the nasal septum 6 hr after treatment were 0.098, 0.033, 0.041, 0.069, 0.064, and 0.045 mg/kg, respectively. The corresponding values, measured 24 hr after treatment, were 0.032, 0.032 and not higher than 0.025-0.028 mg/kg. The findings indicate the sheep thus treated may be slaughtered 24 hr after treatment.

74-1458. Holec, J.; Kredl, F.; Vanek, F. (Sch. Vet. Med., Dept. Food Hyg. Technol., Brno, Czechoslovakia). **Vliv chlorovanych uhlovodiku na jogurtove zrani mleka a vliv tohoto zrani na jejich stabilitu. [Effect of chlorinated hydrocarbons on the yogurt ripening of milk, and effects of this ripening on their stability.]** *Vet. Med. 17(6): 329-335; 1972.* (10 references) (Czech)

Milk treated for yogurt production (17% nonfat solids, 4.5% fat) was artificially contaminated with DDT or lindane dissolved in petroleum ether, at 0.625-10.0 μg/ml. The milk was then further processed to yogurt. The test yogurts did not differ from control samples in organoleptic qualities, in acid development, or in bacterial growth. The DDT and lindane quantities present had no effect on the combined yogurt culture. Gas chromatographic analyses did not reveal degradation or isomerization of the DDT and lindane by *Streptococcus thermophilus* or *Lactobacillus bulgaricus* in two-day-old or six-day-old yogurt. The yogurt biculture did not develop any adaptive mechanism which could affect the DDT or lindane residues even after prolonged contact. (From author abstract)

74-1459. Bolotnyy, A. V.; Yurkova, Z. F. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Lab. Hyg. and Insecticides Toxicology, Kiev, USSR). **Materialy k toksikologo-gigiyenicheskoy otsenke**

novogo fosfororganicheskogo insektitsida gardony. [Materials on the toxicological-hygienic assessment of gardona–a new organophosphorus insecticide.] *Vop. Pitan. 32(6): 60-65; 1973.* (13 references) (Russian)

Experiments concerning the hygienic and toxicological assessment of gardona (tetrachlorvinphos), a new organophosphorus insecticide, are described. The LD50 values were determined as 2,995±450 mg/kg in rats and 1,865±136 mg/kg in mice. The preparation has a broad range of toxic effects, of which the inhibition of the cholinestease activity is prominent. The preparation has negligible cumulative properties, and, unlike many other organophosphorus compounds, it poorly penetrates the skin. In chronic feeding tests gardona affected the cholinesterase activity, the liver function, and, after penetrating the blood-brain barrier, the central nervous system. The threshold dose was 3 mg/kg, while a subliminal dose of 0.6 mg/kg was determined. In rats fed 15 mg/kg doses daily for 10 months, discoplexation of lobular cells, and lymphocyte infiltration around blood vessels in the liver; inhomogeneous plethora in the brain; and protein accumulation in the canalicular epithelium of the kidney were observed. In apples and cabbages residues were detected 15-20 days and 10 days after treatment, respectively.

74-1460. Rappoport, M. B.; Pestova, A. G. (Kiev Sci. Res. Inst. Ind. Hyg. Occup. Dis., Kiev, USSR). **O biologicheskom deystvii diizopropiltrikhloralliltiokarbamata. [Biological effects of diisopropyltrichloroallylthiocarbamate.]** *Vrach. Delo 10: 138-141; 1973.* (11 references) (Russian)

The biological effects of diisopropyltrichloroallylthiocarbamate (triallate) were studied in acute, subacute, and chronic poisoning tests on rats. Functional disorders of the central nervous system and of the respiratory organs, tachypnea, and death from asphyxiation on the second to third day were determined in acute poisoning tests. The LD50 was 1,471 mg/kg, the maximum nontoxic dose being 1,000 mg/kg. Intoxication with the latter dose reduced the succinate dehydrogenase activity by 57%, the lactate dehydrogenase activity by 43%, and the SH group level in the liver by 61%. The pyruvic acid level increased by 28%. Plethora with venous stasis of the inner organs and hyperemia of meninges, central chromatolysis and sometimes karyolysis in the cortical cells, vacuolization of the cytoplasm of liver cells, and edema of the gastric submucosa and myocardium were determined on autopsy. These changes were less pronounced in rats poisoned with 1,000 mg/kg. Plethora, venous stasis, perivascular edema, ectopia of cell nuclei, chromatolysis, proliferation of adventitial cells in the brain, and foci of fatty degeneration and protein dystrophy in the liver and kidney were observed in rats fed 1/10 of LD50 per day for 1, 2, and 3 months.

74-1461. Rodionov, G. A.; Voronina, L. Ya. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Lab. Pathol. Morphol. Histochem., Kiev, USSR). **Vliyaniye khlorofosa na razvitiye i techeniye patologii pecheni v eksperimente. [On the effect of trichlorfon on the course of pathology of the liver in the experiment.]** *Vrach. Delo 11: 48-52; 1973.* (Russian)

The effect of trichlorfon on the course and evolution of carbon tetrachloride induced liver pathology was studied in albino rats in a chronic experiment for 3, 6, and 9 months. The animals were administered 0.1 mg/100 g of 25% solution of carbon tetrachloride in sunflower-seed oil through gastric tube once every three days and 8.5 mg of trichlorfon per kg of body weight (1/100 LD50) daily. The combined administration of carbon tetrachloride and trichlorfon led to more advanced and stable destructive and dystrophic changes of the liver and enhanced the cirrhotic process. The associated administration of these two substances produced a relatively sharper inhibition of the detoxifying function of the liver and produced disorders in the enzymatic and carbohydrate metabolism of the liver.

74-1462. Smith, L. W.; Chang, F. (Hawthorn Park Res. Lab., Mittagong, N.S.W., Australia). **Aminotriazole metabolism in *Cirsium arvense* (L.) Scop. and *Pisum sativum* L.** *Weed Res. 13(4): 339-350; 1973.* (23 references)

Excised leaves as well as intact plants of Canada thistle (*Cirsium arvense* (L.) Scop.) metabolized 3-amino-1,2,4-triazole (aminotriazole) (amitrole) to three major products, Unknowns II, Ia and Ib. Unknown II was identical to β-(3-amino-1,2,4-triazolyl-1-)α-alanine. Unknowns Ia and Ib, previously described as one product, were separated by electrophoresis and thin layer chromatography. Unknown Ia appeared to be a metabolic product of Unknown II while Unknown Ib was derived from Unknown Ia. An enzyme preparation from pea (*Pisum sativum* L. cv. Thompson Laxton) seedlings capable of synthesizing tryptopnan from indole and serine was also able to metabolize aminotriazole. Typtophan synthesis with the enzyme preparation was inhibited by aminotriazole, and evidence suggests that aminotriazole metabolism may follow a similar pathway to tryptophan synthesis. (Author abstract by permission)

74-1463. Marriage, P. B. (Res. Sta., Agr. Canada, Harrow, Ontario, Canada NOR 1GO). **Herbicidal activity and metabolism of dyrene in Canada thistle.** *Weed Sci. 21(5): 389-392; 1973.* (15 references)

The fungicide, Dyrene [2,4-dichloro-6-(*o*-chloroanilino)-*s*-triazine], severely injured var. *mite* of Canada thistle [*Cirsium arvense* (L.) Scop.]; and the damage resembled that caused by bipyridylium herbicides. Regrowth from treated plants was abnormal. Other arylamino-*s*-triazines were from slightly to severely phytotoxic to leaf sections of the var. *mite*. The var. *horridum* of Canada thistle was not affected by Dyrene or related compounds. Dyrene and metabolites of

Dyrene which were phytotoxic to var. *mite* leaf disks in bioassay tests were isolated from treated var. *mite* and *horridum* plants, but none of these compounds injured the var. *horridum*. One metabolite was found only in the var. *mite*; the other five occurred in both varieties. The metabolites were apparently formed from Dyrene by conjugation reactions. (Author abstract by permission)

74-1464. Thorneburg, R. P.; Tweedy, J. A. (Dept. Plant Industries, Southern Illinois Univ., Carbondale, IL 62901). **A rapid procedure to evaluate the effect of pesticides on nitrification.** *Weed Sci. 21(5): 397-399; 1973.* (15 references)

A laboratory procedure for evaluating the effect of pesticides on nitrification in soil proved to be simple to perform, reproducible, and offers a procedure for rapid screening of a large number of chemicals in a short period. The recovery of added nitrate by extracting with distilled water was essentially 100% complete. The conversion of added ammonium to nitrate by the soil microorganisms was nearly complete after the 2-week incubation period. Nitrification in soil treated with several different herbicides and insecticides was determined by our procedure. A nitrification inhibitor, N-Serve (2-chloro-6-trichloromethyl pyridine) was included as a standard. None of the herbicides or insecticides inhibited nitrification and the N-Serve completely inhibited nitrification during the 2-week incubation. (Author abstract by permission)

74-1465. Dudek, C.; Basler, E.; Santelmann, P. W. (Dept. Agron., Oklahoma State Univ., Stillwater, OK 74074). **Absorption and translocation of terbutryn and propazine.** *Weed Sci. 21(5): 440-442; 1973.* (4 references)

The absorption and translocation patterns of terbutryn [2-(*tert*-butylamino)-4-(ethylamino)-6-(methylthio)-*s*-triazine] and propazine [2-chloro-4,6-bis(isopropylamino)-*s*-triazine] were determined in wheat (*Triticum vulgare* Vill. 'Kaw') and sorghum (*Sorghum bicolor* L. 'RS 612'). Bioassay studies showed sorghum to be tolerant and wheat susceptible to terbutryn. Absorption and translocation of uniform ^{14}C-labeled terbutryn from 1 to 24 hr after initial treatment showed the roots of sorghum and the foliage of wheat to be the major site for propazine accumulation with both plant species. Thin-layer chromatography of extracts from terbutryn-treated plants showed that sorghum contained a higher percentage of metabolic breakdown products in the foliage than did the root systems, and wheat contained a high percentage of intact terbutryn in the foliage and roots. High temperature (32 C) enhanced translocation of terbutryn and propazine in both sorghum and wheat. The susceptibility of wheat and sorghum to terbutryn appears to be correlated with a combination of the factors of accumulation within the foliage of the plant and the ability to degrade the terbutryn molecule. (Author abstract by permission)

74-1466. Thomas, V. M., Jr.; Buckley, L. J.; Sullivan, J. D., Jr.; Ikawa, M. (Agr. Res. Cent., Stauffer Chem. Co., Mountain View, CA 94040). **Effect of herbicides on the growth of *Chlorella* and *Bacillus* using the paper disc method.** *Weed Sci. 21(5): 449-451; 1973.* (22 references)

Twenty herbicides were tested for activity in a paper disc agar bioassay. The growth of *Chlorella pyrenoidosa* Chick was inhibited by dinoseb (2-*sec*-butyl-4,6-dinitrophenol), diquat [6,7-dihydropyrido(1,2-a:2′,1′-c)pyrazinediium ion], paraquat (1,1′-dimethyl-4,4′-bipyridinium ion), 3′,4′-dichloro-2-methylvaleranilide, propachlor (2-chloro-*N*-isopropylacetanilide), and linuron [3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea]. The growth of *Bacillus subtilis* Cohn was inhibited by dinoseb, diquat, paraquat, and 3′,4′-dichloro-2-methylvaleranilide. This assay using *C. pyrenoidosa* or *B. subtilis* offers a convenient means for the testing of herbicides. (Author abstract by permission)

74-1467. Hodgson, R. H.; Frear, D. S.; Swanson, H. R.; Regan, L. A. (Metabolism and Radiation Res. Lab., North Central Region, Agr. Res. Serv., U.S. Dept. Agr., Fargo, ND 58102). **Alteration of diphenamid metabolism in tomato by ozone.** *Weed Sci. 21(6): 542-549; 1973.* (51 references)

Fumigation of tomato (*Lycopersicon esculentum* Mill. 'Sheyenne') with low levels of O_3 had little effect on root absorption, translocation, or conversion of diphenamid (*N,N*-dimethyl-2,2-diphenylacetamide) to water-soluble conjugates. However, the proportion of specific conjugates was markedly altered in O_3-fumigated plants. Twenty-four hours after treatment, the predominant conjugates formed in nonfumigated and fumigated tomato were the β-glucoside (MDAG), and the β-gentiobioside (MDAGB), respectively, of *N*-hydroxymethyl-*N*-methyl-2,2-diphenylacetamide. The ratio MDAG:MDAGB was 8.2:1.0 in nonfumigated tissue and 0.6:1.0 in O_3-fumigated tissue. This marked shift foward production of the more polar MDAGB was accompanied by a trend toward increased production of methanol-insoluble residues. A compound having limited stability was extracted from tomato; its probable structure was *N*-hydroxy-methyl-*N*-methyl-2,2-diphenylacetamide (MODA). It is a postulated intermediate in the formation of MDAG and MDAGB from diphenamid. (Author abstract by permission)

74-1468. Holm, R. E.; Stallard, D. E. (Diamond Shamrock Corp., T. R. Evans Res. Cent., P.O. Box 348, Painesville, OH 44077). **Metabolism of a pyrrolidine urea herbicide in corn and weeds.** *Weed Sci. 22(1): 10-14; 1974.* (14 references)

Five 2,5-dimethyl-1-pyrrolidinecarboxanilides were effective inhibitors of the Hill reaction. However, only the *cis* isomers were active; the *trans* isomers were

totally inactive. Experiments were conducted using ^{14}C-5328 (*cis*-2,5-dimethyl-1-pyrrolidinecarboxanilide). A correlation existed between resistance of various plants to 5328 and their ability to metabolize it to water soluble metabolites. Velvetleaf (*Abutilon theophrasti* Medic.) and proso millet (*Panicum miliaceum* L.) seedlings were very susceptible to 5328 and were unable to metabolize it. Tall morningglory [*Ipomoea purpurea* (L.) Roth] seedlings were highly tolerant to 5328 and converted it completely to its metabolites. Corn (*Zea mays* L. 'DeKalb variety XL-45') seedlings which were slightly susceptible to 5328 injury were able to metabolize up to 90% of the parent compound. Corn foliage uptake of ^{14}C-5328 applied to the soil surface occurred through the adventitious roots. (Author abstract by permission)

74-1469. Long, J. W.; Thompson L., Jr.; Rieck, C. E. (Amchem Products, Inc., Ambler, PA). **Absorption, accumulation, and metabolism of benefin, diphenamid, and pebulate by tobacco seedlings.** *Weed Sci. 22(1): 42-47; 1974.* (14 references)

Benefin accumulated rapidly in the roots of tobacco (*Nicotiana tabacum* L. 'Kentucky 14') seedlings incubated in nutrient solution containing ^{14}C-labeled benefin (*N*-butyl-*N*-ethyl-α,α,α-trifluoro-2,6-dinitro-*p*-toluidine) and remained in the roots unaltered. Very low levels of radioactivity were detected in the shoots. Diphenamid (*N,N*-dimethyl-2,2-diphenyl-acetamide) accumulated in the shoots of treated plants throughout the treatment period but remained at low levels in the roots. Diphenamid was extensively metabolized in the shoots but only to a slight extent in the roots. The carbon-14 of pebulate (*S*-propyl butylethylthiocarbamate) accumulated in moderate amounts in both the roots and shoots of the tobacco seedlings, but attempts to recover pebulate failed. (Author abstract by permission)

74-1470. Long, J. W.; Thompson, L. Jr.; Rieck, C. E. (Amchem Products, Inc., Ambler, PA). **Metabolism of ^{14}C-pebulate in seedling tobacco.** *Weed Sci. 22(1): 91-94; 1974.* (8 references)

Extracts from the roots and shoots of tobacco (*Nicotiana tabacum* L. 'Kentucky 14') seedlings treated with ^{14}C-pebulate (*S*-propyl-1-^{14}C butylethylthiocarbamate) were separated into various organic and aqueous phases to determine the distribution of ^{14}C. In the roots the organic acid-carbohydrate fraction became the most highly labeled fraction with time while in the shoots the fraction containing the sterol esters and oligoglycerides was the most highly labeled early in the treatment period but gradually lost radioactivity at later time intervals. Pebulate was not recovered in detectable amounts in either the leaves or roots. (Author abstract by permission)

74-1471. Burt, G. W. (Dept. Agron., Univ. Maryland, College Park, MD 20742). **Translocation and metabolism of atrazine in Canada thistle.** *Weed Sci. 22(2): 116-119; 1974.* (12 references)

Canada thistle (*Cirsum arvense* L.) plants, grown uniformly in a greenhouse, were treated with 900 μg of ring-labeled atrazine each by painting onto the stems and leaves. Plants were harvested 14 days after treatment for autoradiographic and TLC analysis. Considerable atrazine loss occurred by volatilization; a total recovery of 60% was obtained. Over 98% of the activity recovered from the intact plant was found in the shoot where the atrazine was applied; 82% of this activity was chloroform-soluble. According to thin-layer chromatography of the treated shoot extract, 64% of the chloroform fraction was in the form of unaltered atrazine, 6% in the form of 2-chloro-4-amino-6-isopropylamino-*s*-triazine, and 5% in the form of 2-chloro-4-ethylamino-6-amino-*s*-triazine, and 25% was unidentified. Approximately 42% of the radioactivity in the water-soluble fraction of the treated shoot was present as the hydroxy analogs of the above compounds, and the remainder as unidentified materials. Small quantities of atrazine were translocated basipetally.

74-1472. Thompson, O. C.; Truelove, B.; Davis, D. E. (Dept. Bot. and Microbiol., Auburn Univ., Auburn, AL 36830). **Effects of triazines on energy relations of mitochondria and chloroplasts.** *Weed Sci. 22(2): 164-166; 1974.* (22 references)

The effects of eight *s*-triazines on respiration of (*Phaseolus vulgaris* L. 'Black Valentine') bean and rat liver mitochondria and on cyclic photophosphorylation of pea (*Pisum sativum* L. 'Thomas Laxton') chloroplasts were determined. All triazines inhibited state 3 respiration and cyclic photophosphorylation. The degree of inhibition was similar in both rat liver and bean mitochondria. Prometryne [2,4-bis(isopropylamino)-6-(methylthio)-*s*-triazine] was the most potent inhibitor of both respiration and cyclic photophosphorylation. Triazines with the methylthio group showed the most activity, followed by those with the methoxy and chloro substituents in that order. (Author abstract by permission)

74-1473. Hochleitner, H. (Klinik fuer Dermatologie und Syphilidologie, Universitaet Innsbruck, Innsbruck, Austria). **Die Skabies. Epidemiologie, Klinik und Therapie. [Scabies. Epidemiology, clinical picture and therapy.]** *Wien. Klin. Wochenschr. 85(13): 197-202; 1973.* (54 references) (German)

Epidemiological, clinical, and therapeutic aspects of scabies in Austria are surveyed. Sulfoperscatol (2.5% DDT), Sarnex (20% solution of thioformol in gasoline), and especially lindane emulsion are used for the treatment of scabies. Lindane in the form of 0.3% emulsion is rubbed in the skin all over the body with the exception

of the head on three consecutive days. Babies and small children are treated for 3 hr for each of three days and bathed after each treatment to reduce resorption.

74-1474. El-Khadem, M.; Nagib, M. M.; Tewfik, M. S. (Dept. Phytopathol., Fac. Agr., Middle-Delta Univ., Kafr El-Sheik, Egypt). **The effect of certain nitro-herbicides on the growth of some soil-inhabiting fungi.** *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. 2 128(7/8): 780-786; 1973.* (12 references)

A significant decrease in the growth of *Rhizoctonia solani* was observed in the presence of 10 ppm fluorodifen, nitrofen, trifluralin and cobex (dinitramine). Dinoseb, DNOC, and nitralin had no effect. At 1000 ppm, nitralin slightly inhibited growth of the fungus, and all other herbicides completely inhibited it. Only nitrofen and trifluralin had a significant effect on the growth of *Sclerotium bataticola* at 10 ppm. DNOC, dinoseb, and trifluralin, at 1000 ppm, were fungistatic to this species. *Aspergillus flavus* and *Aspergillus niger* were practically not affected by the herbicides.

74-1475. Griegel, B. (Landambulatorium Pretzsch, DDR). **Untersuchungen ueber die differentialdiagnostischen Moeglichkeiten bei subnormalen Cholinesterasewerten unter arbeitshygienischen Aspekten. [Studies concerning the possibilities of differential diagnosis of subnormal cholinesterase values from the viewpoint of occupational hygiene.]** *Z. Gesamte Hyg. 19(7): 505-508; 1973.* (21 references) (German)

The theoretical possibility of routine differential diagnosis of subnormal cholinesterase values in humans was studied in a model experiment, using a mixture of normal human blood samples, methyl parathion, and diethyl parathion. It was possible to differentiate between subnormal cholinesterase values caused by a blockade by alkylphosphates and those conditioned by inhibition of the cholinesterase synthesis, as characteristic of several diseases. The cholinesterase level of normal human blood samples failed to drop to pathological levels during storage for up to six days. The addition of 0.0002 g of methyl parathion to 1,000 ml of mixed blood samples, with subsequent incubation at 37 C resulted in a drop in the cholinesterase level from 4,725 units/1,000 ml to 1,680 units/1,000 ml, a value that, without prompting complaints, indicates the necessity of preventive measures. The same degree of cholinesterase blockade was obtained by a diethyl parathion concentration double that of methyl parathion. The addition of 0.0006 g of obidoxime to the alkylphosphate-treated serum resulted in reactivation of the cholinesterase as quickly as within 15 min, with its maximum at 60 min after addition. The aging of the parathion-cholinesterase complex for six days did not interfere with the cholinesterase reactivation by obidoxime.

74-1476. Zamfir, G.; Apostol, S.; Filipiuc, M.; Alexa, L.; Gavat, V.; Melinte, C. (Inst. Med. Pharm., Iasi, Rumania). **Die Wirkung von Dipterex auf hygienisch bedeutsame Indikatoren des Wassers und auf den Organismus. [Effects of dipterex on hygienically significant indices of water quality and on test organisms.]** *Z. Gesamte Hyg. 19(8): 574-578; 1973.* (11 references) (German)

The effects of dipterex (trichlorfon) were studied on some hygienically significant indices of water quality and on rats. The dipterex concentrations in the water ranged from 0.001 to 1,000 mg/l. for the hygienic tests. High concentrations of dipterex in the water considerably increased the oxidizability and the biochemical oxygen demand, and strongly stimulated the growth of the bacterial and Coli flora. Low to medium concentrations stimulated the growth of phytoplankton, but growth was inhibited by a concentration as high as 1,000 mg/l. Tests with *Daphnia magna* and *Sinapis alba* revealed fairly rapid reduction of the toxicity, i.e., fairly rapid decomposition, of dipterex in low concentrations in water. Dipterex in a concentration of 0.001 mg/l. killed 90% of all *D. magna* in 48 hr. Injections of 1/5 to 1/10 of LD50 to rats stimulated the immunity, evidenced by intensified antibody formation and elevated TO and TH agglutinin levels. Serum bactericidal power was reduced during the first two weeks. Initial increases in the phagocytic index and the phagocyte count were observed during the first 2 weeks of the experiment. Dipterex inhibited the serum cholinesterase activity.

74-1477. Ardatova, A. N.; Ivanayevskiy, V. S. (All-Union Inst. Exp. Vet., USSR). **Raspredeleniye i nakopleniye rtuti v organakh i tkanyakh telyat pri otravlenii granozanom. [Distribution and storage of mercury in animal organs and tissues during poisoning with granosan.]** *Zhivotnovodstvo 2: 71-72; 1973.* (Russian)

The distribution and accumulation of mercury in tissues and organs of 8-10-month-old calves fed a total of 160 g (24 mg/kg) or 100 g (18 mg/kg) of granosan were studied. All animals died within 15-30 days after ingestion of 18-24 mg/kg doses of ethylmercuric chloride. The mercury contents in the liver, kidney, tongue, heart, muscles, spleen, mesenteric lymph nodes, small intestine, cerebral cortex, basis pedunculi, medulla oblongata, cerebellum, and spinal cord were 42.9-47 mg/kg, 26-54.5 mg/kg, 9-33 mg/kg 10.8-42 mg/kg, 12.9-23.3 mg/kg, 18-24 mg/kg, 12.1-30.6 mg/kg, 10.76-33 mg/kg, 9.3-11.5 mg/kg, 6.28-10 mg/kg, 4.58-9.06 mg/kg, 11.8-12.3 mg/kg, and 3.84-8.26 mg/kg, respectively. Meat from granosan-poisoned cattle should not be released for human and animal consumption.

74-1478. Korotkova, O. A.; Volkov, A. I. (Author address not given.) **Puri prevrashcheniya pestitsidov vo vneshney srede i problema ostatkov. [Metabolic path-**

ways of pesticides in external media and the problem of residues.] *Zh. Vses. Khim. Obshchest. 18(5): 552-562; 1973.* (104 references) (Russian)

Studies on the mechanisms of metabolism and decomposition of various pesticides in the environment and problems of pesticide residues are reviewed. *Hydrogenomonas* spp. and *Arthrobacter* spp. in waste waters were able to decompose DDT under aerobic conditions. Organophosphorus pesticides are metabolized by hydrolysis or oxidative dealkylation or dearylation by the action of such enzymes as hydrolases, NADP, and transferases. O-dealkylation, O-dearylation, O-demethylation, and N-dealkylation are among the possible ways of metabolism for organophosphate pesticides. Oxidative desulfurization of thiophosphates and dithiophosphates was observed. Thiophosphates and dithiophosphates are also amenable to dealkylation and dearylation by hydrolases, alkyl transferases, and aryl transferases. Hydrolysis of the ester bonds, oxidative hydroxylation, oxidation, hydroxylation of N-alkyl groups, N-dealkylation, hydrolysis of the amide bond, and conjugation were the essential metabolic pathways for carbamates. The degradation of diazinon, malathion, trichlorfon, mevinphos, methylparathion, parathion, dimethoate, zinophos, and chlorpyrifos was accelerated by the soil microflora. The degradation of the pesticides is influenced by such factors as the pH value, the presence of other contaminants, and the residue concentration. Non-persistent pesticides, when present in high concentration, may behave as persistent ones.

74-1479. Seifert, J.; Davidek, J. (Dept. Food Chem. Anal., Tech. Univ., CS-16628 Praha 6-Dejvice 1905, Czechoslovakia). **The influence of organophosphorus insecticides on yeast dehydrogenases activity.** *Z. Lebensm.-Unters.-Forsch. 153(3): 158-162; 1973.* (11 references)

Malathion, metathion (fenitrothion), intrathion (thiometon)-SO and, to a small degree, dipterex (trichlorfon), stimulated the activity of yeast dehydrogenase in the concentration range of $3 \times 10^{-3} M$. The effect of dipterex was probably due to the hydrolysis product, dichlorvos. After 6 hr the stimulation effect decreased, and after 24 hr a 55% inhibition was observed. Further addition of organophosphate did not increase the activity of the enzyme, and effects were observed regardless of substrate. No stimulation of dehydrogenase occurred when esterases were included in the incubation mixture, but inhibition of esterases in the presence of dehydrogenase was not affected. Cell-membrane structure had to be intact for organophosphates to have a stimulating effect.

74-1480. Sanad, A. J.; Mueller, F. (Universitaet Hohenheim, Isotopenlabor, Stuttgart-Hohenheim, Germany). **Untersuchungen ueber den Metabolismus von ^{14}C-markiertem 2,4-D bei verschiedenen resistenten Unkraeutern. [Studies on metabolism of ^{14}C-labeled 2,4-D in various resistant weeds.]** *Z. Pflanzenkr. Pflanzenschutz 79(11/12): 651-658; 1972.* (17 references) (German)

Translocation and degradation of 2,4-D labeled with ^{14}C at the carboxyl or methylene position were studied in *Datura stramonium* L. and *Galium aparine* L. The results indicate that the degradation rate of the side chain is considerably lower in *D. stramonium* than in *G. aparine.* The decarboxylation of the side chain takes place 10 times faster than the splitting of the complete side chains in *D. stramonium,* whereas in *G. aparine,* these two processes advance at almost the same rate. Rapid and complete metabolism of 2,4-D applied to the leaves of *G. aparine* was observed while 2,4-D accumulated and remained more or less unchanged in *D. Stramonium*. After 2,4-D application via the root system the herbicide could not be detected in the roots of *D. Stramonium*, but a metabolite was found. Large quantities of 2,4-D were determined in the roots of *G. aparine.*

See also **74-1271** **74-1272** **74-1300** **74-1301** **74-1350** **74-1360**

74-1481. Lovins, R. E.; Ellis, S. R.; Tolbert, G. D.; McKinney, C. R. (Dept. Biochem., Univ. of Georgia, Athens, GA 30601). **Liquid chromatography–mass spectrometry. Coupling of a liquid chromatograph to a mass spectrometer.** *Anal. Chem. 45(8): 1553-1556; 1973.* (7 references)

An interface equipped with a motor driven probe was designed to accept the effluent peaks from a liquid chromatograph. The solute is then separated from the solvent by flash evaporation in the probe tip, and the isolated material automatically inserted into the ion source of a mass spectrometer for analysis. The use of an adsorbing material such as charcoal in the probe tip may extend the use of the interface to aid in identification of more volatile substances. In a trial run, a mixture of dieldrin, DDD (TDE), and DDT was separated on the liquid chromatograph; the respective components of the mixture were isolated in the interface and analyzed in the mass spectrometer. As long as the vapor pressure of the solute was less than that of the solvent, isolation by flash evaporation worked efficiently, and each component could be easily isolated and analyzed. The analyses were performed on 50 to 100 μg quantities of material. Due to the 3-5 minute cycle time of the interface, it is necessary to operate the liquid chromatograph in the stopped flow mode.

74-1482. Leavitt, R. A.; Su, G. C. C.; Zabik, M. J. (Pesticide Res. Cent., Michigan State Univ., E. Lansing, MI 48823). **Analytical methodology for bioactive compounds. Photochemically assisted analysis of chlorinated hydrocarbon pesticides in the presence of polychlorinated biphenyls.** *Anal. Chem. 45(12): 2130-2131; 1973.* (12 references)

Polychlorinated biphenyls (PCBs) and DDE, dieldrin, and DDT were determined in mixtures by electron capture GC of the mixture and of its photodegradation products. PCB concentrations were based on the pre-photo exposure peaks not having organochlorine pesticide interference, i.e. Aroclor 1254, and particular degradation products were used to quantitate the amount of each pesticide present. The practical lower limits in the assay were 0.5 ppm for PCB and 0.05 ppm for individual pesticides, and interference was observed when PCB concentrations were 20 to 40 times those of the chlorinated pesticides.

74-1483. Dolan, J. W.; Hall, R. C. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **Enhancement of the sensitivity and selectivity of the Coulson electrolytic conductivity detector to chlorinated hydrocarbon pesticides.** *Anal. Chem. 45(13): 2198-2204; 1973.* (10 references)

Factors affecting the sensitivity of the Coulson electrolytic conductivity detector to organochlorine pesticides, including absorptive surfaces, electrode polarization, system stability, and furnace temperature, were investigated along with reaction gas composition and reaction gas flow rate, which influence selectivity. Sensitivity was improved by replacing the silicone rubber septum and stainless steel fitting at the exit of the pyrolysis furnace with teflon, reducing the i.d. of the quartz reaction tube from 4 to 0.5 mm, increasing the voltage, shielding conductor cables, and using water as solvent. In selectivity studies it was found that it is the bonding character of the C-Cl bond which is responsible for the selective detection of organochlorines in the presence of polychlorinated biphenyls. The formation of HCl, on which the method is based, was significantly retarded by a decrease in temperature and elimination of hydrogen as reaction gas in the case of chlorobenzenes. HCl production from chlorinated aliphatics was enhanced by removal of hydrogen and was not significantly influenced by temperature reductions. Under optimum conditions, a selectivity of 500:1 could be obtained for dieldrin in the presence of Aroclor 1254.

74-1484. Horner, J.; Que Hee, S. S.; Sutherland, R. G. (Dept. of Chem. and Chem. Engineering, Univ. of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N OWO). **Esterification of (2,4-dichlorophenoxy)acetic acid–a quantitative comparison of esterification techniques.** *Anal. Chem. 46(1): 110-112; 1974.* (18 references)

Esterification of 2,4-D with BF_3/alcohol mixtures produces esters in greater than 90% yield in 20 minutes with few byproducts. Diazoalkylation is also efficient but produces many impurities. In addition, the reagent is more difficult to make and is more labile than the BF_3/alcohol mixtures. Mineral acid catalysis of 2,4-D/alcohol mixtures is time consuming and inefficient. The esters produced by silylation are unstable. (Author abstract reprinted by permission of the American Chemical Society)

74-1485. Galik, A. (Lachema N.C., 33151 Kaznejov, Pilsen North, Czechoslovakia). **Thin-layer chromatography of metal chelates. Part II. An extended theory and its testing on metal dithizonates and metal diethyldithiocarbamates.** *Anal. Chim. Acta 67(2): 357-376; 1973.* (25 references)

The model of thin-layer chromatography suggested earlier has been developed so that it describes solute behavior more thoroughly. Equations have been derived which describe particular cases such as development by a single solvent, or by a mixture of two solvents of different polarity, or by a mixed solvent of constant composition at varying humidity. Experimental verification was provided by a study of the TLC behavior of metal dithizonates and diethyldithiocarbamates on Silufol. A comparison of the mobilities of these metal chelates, as well as of those of 8-hydroxyquinoline, salicylaldoxime and benzoylacetone, with their extraction constants showed a mutual correlation between these properties. (Author abstract by permission)

74-1486. Voss, G.; Blass, W. (Agrochem. Div., Ciba-Geigy Ltd., Basel, Switzerland). **A solvent-saving extraction-evaporation apparatus developed for residue analysis of pesticides.** *Analyst (London) 98(1172): 811-812; 1973.* (1 reference)

An apparatus that simultaneously allows Soxhlet extraction of pesticides and concentration of the resulting extract has been designed. The evaporated solvent is refluxed into the Soxhlet flask where it is utilized again for the extraction. The major advantages of this cyclic extraction–evaporation system are that redistillation of solvents prior to extraction can be omitted, that manual work is reduced, as the solvent evaporation process occurs simultaneously with the extraction of the sample, and that excess of solvent is not wasted but re-utilized for extraction, which is of interest from the economic and environmental contamination points of view. (Author abstract by permission)

74-1487. Czegledi-Janko, G. (Inst. Chem. Food Anal., Budapest, Hungary). **Gas-liquid chromatographic determination of alpha-, beta-, gamma- and delta-BHC levels in human blood, depot fat and various organs with the use of 2,2-dimethylpropane-1,3-diol succinate as the stationary liquid phase.** *Analyst (London) 98(1173): 863-872; 1973.* (24 references)

The presence of various BHC isomers in the human organism has received relatively little attention, and studies were often restricted to only one BHC isomer. A previously described one-step extraction and clean-up procedure before gas-liquid chromatographic determination of organochlorine pesticide residues in human blood has now been applied to various organs and depot fat. The identification of the BHC isomers was performed by gas-liquid chromatography with several stationary liquid phases. 2,2-Dimethylpropane-1,3-diol succinate was found to be the most satisfactory stationary liquid phase for the present purpose, as it gave distinctly separated peaks and characteristic relative retention times. (Author abstract by permission)

74-1488. Kubasik, N. P.; Volosin, M. T. (Clin. Lab., Genesee Hosp., Rochester, NY 14607). **A simplified determination of urinary cadmium, lead, and thallium, with use of carbon rod atomization and atomic absorption spectrophotometry.** *Clin. Chem. 19(9): 954-958; 1973.* (6 references)

For determination of lead, cadmium, and thallium in a single 3-ml urine sample, the three metals are simultaneously chelated with sodium diethyl dithiocarbamate. The chelates are extracted into methyl isobutyl ketone at pH 3-7, and the carbon rod atomizer is used to analyze the extracts. The carbon rod atomizer has increased the sensitivity of flameless atomic absorption spectrometry and lowered the detection limits, permitting the use of smaller size samples. These samples (1.6 μl) can then be handled in small-volume, low-lead, commercial, disposable glassware. Variations in results within a run were less than 5%; the recovery range was 96-106%. Excessive levels of some normal urinary constituents slightly affected the results.

74-1489. Gal, J. Y.; Martinat, J. P.; Yvernault, T. (Laboratoire de Chimie generale et analytique, U.E.R. des Sciences, Limoges, France). **Dosages des produits de l'hydrolyse acide de l'hexamethylphosphotriamide (HMPT) en milieu aqueux. [Determination of the acid hydrolysis products of hexamethylphosphotriamide (HMPT) in aqueous medium.]** *C. R. Acad. Sci. Ser. C. 277(20): 1009-1012; 1973.* (5 references) (French)

A simple analytical method is described for the determination of hexamethylphosphotriamide (hempa) and of the three acids formed during its acid hydrolysis in aqueous milieu. Samples for determination of hempa are extracted with chloroform. Then the chloroform is evaporated, and the residue is dissolved in anhydrous acetic acid for potentiometric determination against perchloric acid in acetic acid standard solution. The equivalence point is determined using a pH meter with an ordinary glass electrode. For the determination of the three acids formed during acid hydrolysis in aqueous medium, the respective pK values of the hydroxylated acids were determined. The first determination is performed using soda, then another sample is analyzed with silver nitrate and soda. In acetic acid, hempa acts as a monobase of a strength comparable to that of urea and *N,N*-dimethylacetamide.

74-1490. Gamson, R. M.; Robinson, D. W.; Goodman, A. (Development and Engineering Directorate, Edgewood Arsenal, Aberdeen Proving Ground, MD 21010). **Test for anticholinesterase materials in water.** *Environ. Sci. Technol. 7(13): 1137-1140; 1973.* (10 references)

A simple device containing paper impregnated with cholinesterase is reported for detection of organophosphorus inhibitors in the ppb to ppm range in water. Optimum performance is obtained at 20°C and pH 8. Under these conditions, the enzyme is completely inhibited in 20 min or less by 10 ppb up to 1 ppm depending on the inhibitor. Comparison of inhibition data with rate constants indicates that the sensitivity of the device to any given inhibitor can be estimated if the rate constant value is known for that inhibitor with horse serum cholinesterase. (Author abstract reprinted by permission of the American Chemical Society)

74-1491. Ganguly, S. K.; Bhattacharyya, J. (State Forensic Sci. Lab. West Bengal, Calcutta, India). **Detection of small amounts of pesticides in human biological material by thin-layer chromatography.** *Forensic Sci. 2(3): 333-338; 1973.* (13 references)

The TLC method for determination of small amounts of pesticides in biological material is simple and

can be used on mixtures of pesticides. Samples are first isolated by solvent and/or steam distillation and purified on columns containing activated charcoal, alumina, and anhydrous sodium sulfate. About 0.05 ml of purified extract (acetone solution) is spotted on a silica gel plate, and the plate is developed in an appropriate solvent. Suitable spray reagents are used to locate the spots. Aldrin, dieldrin, and endrin can be separated in a mixture using *n*-hexane-chloroform-acetic acid as solvent and rhodamine B as spray reagent. Malathion can be separated from these pesticides using the same solvent system and rhodamine B and palladium chloride as spray reagents. Rogor (dimethoate), metasystox (methyl demeton) and thiodan (endosulfan) can be resolved using *n*-hexane-ethyl acetate-acetone-acetic acid as solvent system. The conditions and *Rf* values for separation and identification of a number of pesticides are included.

74-1492. Plasch, G. (Author address not given). **Zur Frage von Rueckstandsuntersuchungen im Muehlenlabor. [On residue analysis in mill laboratories.]** *Getriede Mehl 27(1): 15-18; 1973.* (German)

A preparative and thin-layer chromatographic method for the qualitative determination of lindane, malathion, methyl bromide, pyrethrins, and piperonyl butoxide in grain and milled products is described. The determination of malathion and lindane is used as an example. The residue is extracted in repeated steps by means of *n*-hexane and dimethyl sulfoxide. The residue from the hexane extract is combined with ethanol and purified on a Sephadex LH-20 column for elution with freshly distilled ethanol. The flow rate applied for gel filtration is 150 ml/h. The obtained malathion phase is determined on polyamide plates with 90:10 ratio of *n*-hexane and glacial acetic acid as solvent and 0.4% solution of Congo red in bromine atmosphere as visualizing reagent. Lindane is determined on silica gel G plates with 90:10 ratio of *n*-hexane with diethylether as solvent and 5% alcoholic solution of *o*-toluidine for subsequent UV irradiation.

74-1493. Gauer, W. O.; Seiber, J. N.*; Crosby, D. G. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **Determination of organotin residues from plictran in fruit crops by gas-liquid chromatography.** *J. Agr. Food Chem. 22(2): 252-254; 1974.* (5 references)

A gas-liquid chromatographic method is described for determining residues of tricyclohexyltin hydroxide and its dicyclohexyl metabolite on strawberries, apples, and grapes treated with plictran miticide. Crop samples were extracted with benzene and derivatized with aqueous hydrobromic acid. A silica gel chromatographic cleanup following derivatization was used when residue levels were less than 1 ppm. Background interferences were minimized through use of a halide-selective Coulson conductivity detector. Recoveries of tricyclohexyltin hydroxide from fortified crop samples were 80-95% at 1 ppm and 78-89% at 0.1 ppm. Conditions are included for gas-liquid chromatography of cyclohexylstannoic acid, a second potential degradation product of plictran. (Author abstract reprinted by permission of the American Chemical Society).

74-1494. Mendoza, C. E.; Shields, J. B. (Biochem. Dept., Arrhenius Lab., Stockholm Univ., Fack, S-104 05 Stockholm, Sweden). **Determination of methomyl by using 1-fluoro-2,4-dinitrobenzene reaction and gas-liquid chromatography.** *J. Agr. Food Chem. 22(2): 255-258; 1974.* (8 references)

A method using 1-fluoro-2,4-dinitrobenzene (DNFB) for determination of methomyl (syn) isomer or Lannate (*S*-methyl *N*[(methylcarbamoyl)oxy]thioacetimidate) is reported. It involves hydrolysis of methomyl by sodium hydroxide immediately before addition of DNFB. The methylamine derived from methomyl is then allowed to react with DNFB at 80-82° in a water bath equipped with a shaker. The reaction product 2,4-dinitrophenylmethylamine (DNPMA) is extracted with benzene and analyzed by gas-liquid chromatography. Optimum conditions affecting DNFB and methylamine are also reported. Recoveries of methomyl added to rapeseed oil at 0.01-1 ppm range from 80 to 105%, with an average of about 97%. The technique gives quantitative recoveries of DNPMA from methomyl (anti) isomer and carbaryl standards. Dinitrophenyldimethylamine was also obtained from Zectran (mexacarbate). (Author abstract reprinted by permission of the American Chemical Society)

74-1495. Rouchaud, J. P.; Decallonne, J. R.* (Lab. de Phytopathol. et de Mycol. Generale, Univ. Catholique de Louvain, 3030 Haverlee, Belgium). **A gas chromatographic method for the analysis of MBC in plants and soil.** *J. Agr. Food Chem. 22(2): 259-260; 1974.* (7 references)

A method has been developed for the extraction, cleanup, and gas chromatographic analysis of MBC (methyl 2-benzimidazolecarbamate) in melon plants and soil previously treated with benomyl fungicide. Residual benomyl and MBC are extracted with benzene and partitioned into 0.1 *N*-hydrochloric acid. The acidic layer is washed several times with chloroform and then neutralized. The single residual product MBC (present initially in the plant and soil or formed during the acidic cleanup by the quantitative hydrolysis of benomyl) is partitioned into ethyl acetate. MBC is then trifluoroacetylated giving MBC-TFA, and the derivatized MBC is measured by GLC using an electron capture detector. The lower limit of sensitivity of this method is 0.02 ppm. Overall recovery of benomyl residue obtained from fortified control samples ranged from 80 to 100%. (Author abstract reprinted by permission of the American Chemical Society).

74-1496. Rhee, K. S.; Plapp, F. W., Jr.* (Dept. Entomol., Texas A and M Univ., College Station, TX 77843). **A rapid method for estimating microsomal oxidase activity in the housefly with (^{14}C)parathion as substrate.** *J. Agr. Food Chem. 22(2): 261-264; 1974.* (18 references)

A sensitive method was developed for rapid estimation of microsomal oxidase activity in the housefly using [^{14}C]parathion as the substrate. The method measures both activation and degradation of parathion in vitro. The procedure is also applicable to enzyme preparations from other insects. In addition, it can be used to measure induction of microsomal activity in the housefly. Microsomal metabolism measured by this method was enhanced by a low concentration of bovine serum albumin, but higher concentrations resulted in a decrease in metabolism. Relative activities determined by this procedure were comparable with those obtained by the more commonly used but slower method of cyclodiene epoxidase measurement. (Author abstract reprinted by permission of the American Chemical Society)

74-1497. Haeberer, A. F.; Schlotzhauer, W. S.; Chortyk, O. T. (U.S. Dept. Agr., Agr. Res. Serv., Russell Agr. Res. Center, Athens, GA 30604). **A rapid quantitative method for maleic hydrazide.** *J. Agr. Food Chem. 22(2): 328-330; 1974.* (4 references)

Maleic hydrazide (1,2-dihydro-3,6-pyridazinedione), a systemic plant growth regulator, is used extensively as a tobacco sucker inhibitor. A rapid analytical method for determining residual quantities of maleic hydrazide (MH) has been developed and involves direct extraction and derivatization to form the bis(trimethylsilyl) derivative, measurable by flame ionization gas chromatography. This method has been applied to tobacco leaf, midribs, reconstituted sheet, and cigarettes and should also be applicable to the analysis of MH in other plants or plant extracts. Various aspects of methodology are discussed and residue values for different tobaccos are presented. (Author abstract reprinted by permission of the American Chemical Society)

74-1498. Frei-Haeusler, M.; Frei, R. W.; Hutzinger, O. (Dept. of Chem., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Determination of hydroxybiphenyls as dansyl derivatives.** *J. Chromatogr. 79: 209-216; 1973.* (21 references)

The reaction conditions for the fluorigenic labeling of mono- and dihydroxybiphenyls with dansyl chloride were investigated. The hydroxybiphenyls were made to react in an acetone-water solution with a 10-fold excess of dansyl chloride, buffered with sodium carbonate at about pH 11. The reaction was carried out at 45° for 15 min. After hydrolysis of the excess of dansyl chloride and subsequent extraction with *n*-hexane, an aliquot of the reaction mixture was spotted on to a thin-layer plate. The separated derivatives were identified by their *Rf* values as well as by their mass and fluorescence spectra. The yellow fluorescent derivatives can be analyzed with a relative standard deviation of 4-5%. Detection limits are in the low nanogram region, and linear calibration curves between 5 and 500 ng are observed. As an application of this method, 4-hydroxybiphenyl, which was isolated from the urine of rats treated with biphenyl, was derivatized with dansyl chloride and its identity confirmed by thin-layer chromatography and fluorescence and mass spectrometry. (Author abstract by permission)

74-1499. Schuphan, I.; Geike, F. (Inst. fuer Pflanzenschutzmittelforschung, Biol. Bundesanstalt fuer Land- und Forstwirtschaft, D1 Berlin 33, DDR). **Zum Metabolismus von Phenylharnstoffen. I. Duennschichtchromatographische Trennung und Nachweis von aliphatischen Hydroxylaminen neben niederen Aminen. [Metabolism of phenylureas. I. Thin-layer chromatographic separation and identification of aliphatic hydroxylamines in the presence of aliphatic amines.]** *J. Chromatogr. 84(1): 117-128; 1973.* (25 references) (German)

Methyl-substituted hydroxylamines, which can be formed as metabolites from various pesticides, were easily separated in the presence of alkylamines by thin-layer chromatography (TLC). The volatile hydroxylamines were steam-distilled from crop samples, concentrated in diluted hydrochloric acid and then chromatographed as hydrochlorides in dioxane-ethanol-1 *N* HCl (3:3:1) on cellulose layers. To ensure the identity of the hydroxylamines, they were converted to 2,4-dinitrophenyl and 4-chlorophenylcarbamoyl derivatives. These compounds could be separated by thin-layer chromatography on silica gel using several solvent systems. The detection limits were in the range of 1 μg for the hydrochlorides up to 0.1 μg for the 2,4-dinitrophenyl and 4-chlorophenylcarbamoyl derivatives. (Author abstract by permission)

74-1500. Frei-Haeusler, M.; Frei, R. W.; Hutzinger, O. (Dept. Chem., Trace Anal. Res. Cent., Dalhousie Univ., Halifax, Nova Scotia, Canada). **An investigation of fluorigenic labelling of chlorophenols with dansyl chloride.** *J. Chromatogr. 84(1): 214-217; 1973.* (5 references)

Chlorophenol fungicides, preservatives, and pesticide derivatives have been evaluated semiquantitatively on thin-layer chromatography (TLC) plates, using various spray reagents with detection limits in the submicrogram range. A more selective and sensitive method under development involves the formation of dansyl derivatives, separation by TLC, and *in situ* fluorescence measurements. The dansylation of the free hydroxyl groups was performed under reaction conditions previously described (see abstract no. 74-1499), except that

the reaction was allowed to proceed overnight. The hexane extract was spotted onto the TLC plate, and benzene-chloroform (1:1) was used as the separation solvent. After development, the plates were sprayed with triethanolamine in 2-propanol. Identities of the dansyl derivatives of some chlorophenols were confirmed by mass spectrometry; fluorescence emission spectra and relative intensities of the derivatives were compared.

74-1501. Tanaka, F. S.; Wien, R. G. (Agr. Res. Serv., U.S.D.A., Metab. Radiation Res. Lab., State Univ. Sta., Fargo, ND 58102). **Gas chromatography of substituted phenylureas by flash-heater methylation with trimethylanilinium hydroxide.** *J. Chromatogr. 87(1): 85-93; 1973.* (11 references)

A simple method for the methylation of substituted phenylureas with trimethylanilinium hydroxide (methelute) is described. The methylation reaction product was the 3-*N*-methyl analog of the substituted phenylurea. Seven phenylureas with a variety of structures were analyzed using six different chromatographic columns. The gas chromatographic response was linear with increased concentration of the 3-*N*-methyl analogs of monuron and diuron for both synthetic standards and flash-heater reaction products. Maximum methylation was obtained when the ratio of methylating reagent to phenylurea was approximately 2.5:1. This methylation technique provides for rapid qualitative and quantitative chromatography of substituted phenylureas without side-chain decomposition. (Author abstract by permission)

74-1502. Geike, F. (Inst. fuer Pflanzenschutzmittelforschung, Biol. Bundesanstalt fuer Land- und Forstwirtschaft, D1 Berlin 33, Germany). **Duennschichtchromatographischer Screening-Test ueber die Hemmeigenschaften von Phenylharnstoff-Herbiziden gegenueber einigen Enzymen. [A thin-layer chromatographic screening test for the detection of inhibiting properties of phenylurea herbicides on certain enzymes.]** *J. Chromatogr. 87(1): 199-210; 1973.* (40 references) (German)

The possibility of employing a thin-layer chromatographic enzymatic inhibition technique using bovine liver esterase, alkaline and acid phosphatase, trypsin and chymotrypsin, α- and β-amylase, and urease for the detection of phenylurea herbicides is studied. While the untreated substances, with the exception of benzomarc and metoxymarc have some influence on bovine liver esterase only at high concentrations, identification is possible for most of the herbicides after UV irradiation at concentrations below 1 μg. Both phosphatases in most cases are very strongly inhibited and in some cases UV irradiation brings about significant improvement in detection limits. The proteases trypsin and chymotrypsin are inhibited by only a few phenylureas at high concentration, chymotrypsin being more sensitive than trypsin. α-Amylase is inhibited by only a few herbicides at high concentrations, while β-amylase is moderately inhibited by all substances. Finally, urease is moderately inhibited too by most of the phenylurea herbicides studied. (Author abstract by permission)

74-1503. Tripathi, R. K.; Bhaktavatsalam, G. (Dept. Plant Pathol., G. B. Pant Univ. Agr. Technol., Pantnagar, Nainital, India). **Silver nitrate-bromophenol blue and potassium permanganate-sulphuric acid as chromogenic reagents for the detection of carboxin and oxycarboxin in thin-layer chromatography.** *J. Chromatogr. 87(1): 283-286; 1973.* (4 references)

Carboxin and oxycarboxin have previously been detected under ultraviolet light using a fluorescent indicator; two visible-range reagents, one that can detect both of these compounds and the other only carboxin, have now been found. A silver nitrate-bromophenol blue reagent was prepared by dissolving 0.1 g of bromophenol blue in 10 ml of acetone and diluting the solution to 100 ml with a 1% (w/v) solution of silver nitrate in 1:3 aqueous acetone. A potassium permanganate-sulfuric acid reagent was prepared by dissolving 0.5 g of potassium permanganate in 15 ml of concentrated sulfuric acid. The fungicides were spotted onto silica gel plates and the plates developed in chloroform for 90 min. The plates were left to dry, then sprayed with the appropriate reagent. After heating for 10 min at 110°C, the plates sprayed with silver nitrate-bromophenol blue developed a deep blue color at the carboxin spots, but not with oxycarboxin. The light blue background color of the silica gel plates could be removed by spraying with acetic acid, if desired. The permanganate reagent yielded white spots for both fungicides against a pinkish background. The minimum detectable amounts of fungicide with the two reagents were 2 μg and 3 μg respectively. Attempts are being made to detect carboxin in solution with the first-mentioned reagent. Other fungicides also give the reactions described.

74-1504. Chambon, P.; Chambon, R. (Lab. Toxicol. Hyg. Ind., U.E.R. des Sciences Pharmaceutiques, 69008 Lyon, France). **Recherche et dosage du 4,6-dinitro-*o*-cresol dans l'eau. [Identification and determination of 4,6-dinitro-*o*-cresol in water.]** *J. Chromatogr. 87(1): 287-289; 1973.* (7 references) (French)

DNOC is extracted from a one-liter water sample with 200 ml of acidified ether. The ether is evaporated; the residue is dried with sodium sulfate, and redissolved in ether. After evaporation of this ether under a nitrogen stream, the residue is dissolved in 200 ml of methanol and spotted onto a cellulose TLC plate. The plate is developed in butanol saturated with ammonia (5%) for ca. 2 hr. No detection reagent is necessary, as the DNOC spot is bright yellow. The detection limit is ca. 0.5 μg, and the *Rf* 0.75. For quantitative determination, the DNOC spot is scraped from the plate; 0.05 ml of 50% acetic acid and 5 ml of methanol are added. The super-

natant is treated with concentrated sodium hydroxide, and the color (which develops immediately) is read in a spectrophotometer at 370 nm. Other cresols and nitrophenols have *Rf* values below that of DNOC. Only picric acid has a similar *Rf* (= 0.72), but it is not decolorized in the presence of acid. This fact can be used for differentiation.

74-1505. Mahel'ova, H.; Sackmauerova, M.; Szokolay, A.; Kovac, J. (Res. Inst. Hyg. and Res. Inst. Agrochem. Technol., Bratislava, Czechoslovakia). **Determination of BHC isomers in soils by gas-liquid chromatography after extraction with light petroleum.** *J. Chromatogr. 89(2): 177-183; 1974.* (15 references)

The determination of residues of BHC isomers in soils by means of both gas-liquid and thin-layer chromatography and the conditions for their extraction in the presence of both DDT and DDE were studied. A method for the deactivation of soil by water using active silica was developed. By this means, a constant powdery consistency was obtained, which permitted the use of a specific extraction solvent (low-boiling light petroleum) under conditions of Soxhlet extraction. In contrast to extraction procedures using the *n*-hexane-acetone system as solvent, the present method markedly reduces the proportion of coextracted materials, so that in addition to DDT and DDE, the α-, β-, γ- and δ-isomers of BHC can also be determined simultaneously in clay soils. The yield given by the proposed method of Soxhlet extraction ranges between 81.8 and 105.8% according to the type of insecticide. (Author abstract by permission)

74-1506. Musty, P. R.; Nickless, G. (Dept. Inorganic Chem., Sch. Chem., The University, Bristol BS8 1TS, England). **Use of Amberlite XAD-4 for extraction and recovery of chlorinated insecticides and polychlorinated biphenyls from water.** *J. Chromatogr. 89(2): 185-190; 1974.* (9 references)

Amberlite XAD macroreticular resinous adsorbents were used for the extraction and recovery of both chlorinated insecticides and polychlorinated biphenyls from water. One liter of tap water was doped at the ppb level and after passage through the resin the adsorbed insecticides were eluted with a diethyl ether-hexane mixture. When determined by electron capture gas chromatography, aldrin and *p,p'*-DDE were the only insecticides not quantitatively recovered. The recovery of polychlorinated biphenyls was usually around 76%. (Author abstract by permission)

74-1507. Williams, I. H. (Res. Sta., Canada Agr., Vancouver, B.C., Canada). **Photochemical oxidation of hexane isomers to compounds sensitive to electron capture detection.** *J. Chromatogr. Sci. 11(9): 593-596; 1973.*

Hexane, prepared by redistilling a commercial mixture of hexane isomers, gave little GLC-ECD response when freshly prepared. Within several weeks, interference peaks developed, and eventually became broad enough to interfere with pesticide analysis. No decomposition was evident in a distilled hexane sample stored in the light for six months, whereas six new compounds appeared in the sample exposed to fluorescent laboratory lighting. Comparison of isomer mixtures showed that *n*-hexane is subject to some photodecomposition, but other hexane isomers are far more reactive. When present as contaminants, these can account for principal impurity peaks. The process is apparently oxidative, since no significant amounts of irradiation products were formed when specially purified hexane was irradiated in the absence of oxygen. One type of activated charcoal failed to adsorb the impurities, but another (an alkaline animal type) removed them completely and maintained an impurity-free product for more than a year.

74-1508. Frei, R. W.; Lawrence, J. F.; Hope, J.; Cassidy, R. M. (Anal. Dept., Pharmaceutical Div., Sandoz A.G. 4002 Basel, Switzerland). **Analysis of carbamate insecticides by fluorigenic labelling and high-speed liquid chromatography.** *J. Chromatogr. Sci. 12(1): 40-44; 1974.* (12 references)

The usefulness of combined fluorigenic labeling and high-speed liquid chromatography (HSLS) as an analytical tool was demonstrated with *N*-methyl carbamate insecticides. Water and soil samples fortified with Mesurol (methiocarb) or carbofuran were extracted with methylene chloride or acetone. The extract was evaporated to dryness and the residue reacted with dansyl chloride in sodium carbonate solution. The liquid chromatograph was connected to a Turner III fluorometer and fitted with test columns of Zipax-BOP, Porasil A-BOP, and Corasil-BOP. Good efficiencies were obtained with Zipax and Corasil for the carbamate derivatives. A number of carbamates were successfully separated by this method and limits of detection were 2-10 μg per injection.

74-1509. Mukherjee, G.; Banerjee, T. S.; Mukherjee, A. K.; Mathew, T. V. (Central Food Lab., Calcutta, India). **Colorimetric estimation of dichlorvos (DDVP).** *J. Food Sci. Technol. (Mysore) 10(3): 126; 1973.* (10 references)

A rapid method for quantitative estimation of dichlorvos in formulations begins with the dichlorvos sample and four standards in test tubes. The dichlorvos is hydrolyzed by adding 1 ml of 5% NaOH to each tube, and immersing the tubes in an ice bath for 30 min. The hydrolyzed solutions are transferred to separating funnels; 25 ml of carbon tetrachloride and 15 ml of alcohol are added. After 3 min of shaking, 25 ml of distilled water and 5 ml of carbon disulfide are added, and shaking is repeated. The carbon tetrachloride layer is discarded. The color intensity in the aqueous layer is

read in a colorimeter within 15 min. The color intensity decreases with increasing dichlorvos concentration. The detection limit of this method is as low as 1 g. Color formation is probably due to formation of sodium xanthate complex from carbon disulfide, ethyl alcohol, and alkali. Since the amount of alkali added is constant, the quantity consumed for hydrolysis of dichlorvos is used as an indirect measure of dichlorvos concentration.

74-1510. Makarova, S. V.; Yeliseyeva, M. A. (All-Union Sci. Res. Inst. Chemical Plant Protection, USSR). **Analiz fentiurama. [Analysis of fenthiuram.]** *Khim. Sel. Khoz. 11(9): 680-682; 1973.* (3 references) (Russian)

Methods for the determination of thiram, lindane, and copper 2,4,5-trichlorophenolate, components of the seed-dressing agent fenthiuram, are described. Thiram is decomposed into carbon disulfide by means of phosphoric acid in the presence of sodium ethylene diamine tetraacetate. The CS_2 formed is absorbed by methanolic solution of potassium hydroxide and the xanthogenate thus formed is titrated with iodine solution. Lindane is determined from the chlorine released during hydrolysis, following extraction with petroleum ether. Copper 2,4,5-trichlorophenolate is determined iodometrically from its copper content following mineralization and treatment of the incineration residue with sulfuric acid.

74-1511. Bobrova, V. I.; Bernatskaya, L. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Metod opredeleniya geksilura v vode, pochve i produktakh rastitel'nogo proiskhozhdeniya. [Method of determining hexalure in water, soil, and products of vegetable origin.]** *Khim. Sel. Khoz. 11(9): 698-699; 1973.* (2 references) (Russian)

Hexalure residues in water, soil, and products of vegetable origin, such as beets can be qualitatively and quantitatively determined by TLC. Following chloroform extraction of the hexalure residue from water, soil, and plant material samples, the extract is applied on silicagel layer, using 8:1 ratio of acetone with chloroform, after which it is subsequently exposed to mercury vapor lamp light and chlorine vapor. After drying in the presence of 1:1 ratio of potassium permanganate solution with hydrochloric acid, hexalure is visualized in the form of grayish-blue spots by means of ortho-toluidine. The determination is based upon the photochemical decomposition of hexalure with subsequent visualization of the chlorinated derivatives by means of ortho-toluidine. The sensitivity amounts to 0.025 mg/liter in water, and to 0.05-0.1 mg/kg in soil and products of vegetable origin. The Rf value averages 0.52±0.05.

74-1512. Ebing, W. (Institut fuer Planzenschutzmittelforschung, Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Berlin-Dahlem, Germany). **Gaschromatographie der Pflanzenschutzmittel. Tabellarische Literaturreferate II. [Gas chromatography of pesticides. Tabular reference list Part II.]** *Mitt. Biol. Bundesanst. Land- Forstwirt. Berlin-Dahlem 143: 3-27; 1972.* (German)

Three hundred and fifty publications on the gas chromatographic investigation of pesticides, with cross references to the pesticides investigated and to the substrates in which they were detected, are listed. Most of the publications listed are from 1970 and 1971. The present reference list forms a first supplement to a previously published compilation.

74-1513. Bami, H. L. (Cent. Forensic Sci. Lab., CBI New Delhi, India). **Need for agreed methods of analysis of toxic pesticide residues.** *Pesticides 7(9): 29-32; 1973.* (15 references)

Techniques available for pesticide residue analysis depend on: careful sampling and sample storage; proper processing of the sample for efficient extraction; choice of correct solvent; clean-up using column or paper chromatography, liquid/liquid partition, steam distillation, enzyme hydrolysis, and precipitation of fats; and analysis by GC, TLC, and spectrophotometry. For analysis, polarography, MS, and neutron activation analysis can be used. However, these require sophisticated equipment and are often no more sensitive than other techniques. Since pesticide use should continue to grow, the Indian government is interested in monitoring residues in agricultural products. Such a program will require standardization of analysis techniques throughout India. The methods adopted need not be the most sensitive, since only available equipment will be used, but the data must be reproducible to be relevant.

74-1514. Phillips, F. T.; Sethi, G. R.; Kavadia, V. S. (Rothamsted Exp. Sta., Harpenden, Herts., England). **Quick estimation of dieldrin in fresh cotton-leaf samples.** *Pestic. Sci. 4(6): 811-816; 1973.* (7 references)

Hexane was the most convenient extraction solvent. Consistent recoveries of 80% dieldrin were obtained after cold grinding with 10 ml hexane/g of leaf for 5 min. After filtering, solutions did not require a "clean-up" before GLC analysis, provided they were not concentrated further. Radioactive dieldrin in such extracts could be directly counted with a simple scintillation apparatus if pre-treated with acidified potassium permanganate solution to eliminate the color-quenching effect and stored in the dark for 24 h to allow phosphorescence from some leaf materials to decay. Extractions using other solvents would need a "clean-up" procedure before GLC analysis, but radioactive dieldrin in hexane-isopropanol extracts could be quickly estimated by simple scintillation counting after decolorization with sodium hypochlorite and storage in the dark for 24 h. (Author abstract by permission)

74-1515. Moellhoff, E. (Pflanzenschutz Anwendungstechnik, Biol. Forschung, Farbenfabriken Bayer AG, Leverkusen, Germany). **Method for gas chromatographic determination of Tamaron residues in plants.** *Pflanzenschutz-Nachr. 24(2): 252-258; 1971.* (3 references)

A method developed for the GC determination of tamaron (Bayer 71 628, methamidophos) in plants had a sensitivity from 0.01 to 0.1 ppm. Samples were macerated with Na_2CO_3 and acetone and shaken with hexane. The water-acetone phase was saturated with NaCl, extracted with $CHCl_3$. The $CHCl_3$ extract was concentrated and analyzed on a GC fitted with a phosphorus detector. Recoveries were greater than 80% from apples, eggplants, cauliflower, cauliflower leaves, snap beans, hop cones, potatoes, peaches, tomatoes, sugar beet tops, and onions.

74-1516. Van der Merwe, J. H.; Taylor, W. B. (Pestic. Residue Lab., Gen. Chem. Div., S. African Bur. Standards, Pretoria, S. Africa). **Gas chromatographic determination of demeton-*S*-methyl residues in plant material.** *Pflanzenschutz-Nachr. 24(2): 259-264; 1971.* (5 references)

Demeton-*S*-methyl residues in plant material have been determined by a GC method having a limit of detection of 0.05 ppm. The material was macerated in acetone, the acetone evaporated, and plant substances precipitated with ammonium chloride and orthophosphoric acid. Residues in the extract were oxidized to the sulfone and determined by GC using a flame photometric detector. Recoveries from wheat, sorghum ears, and sorghum foliage were $>$ 100% with demeton-*S*-methyl and the sulfone, but the sulfoxide was recovered quantitatively only from samples containing $>$ 0.5 ppm.

74-1517. Frehse, H. (Pflanzenschutz Anwendungstechnik, Biol. Forschung, Farbenfabriken Bayer AG, Leverkusen, Germany). **Analysis of organophosphorus pesticide residues II.** *Pflanzenschutz-Nachr. 24(2): 265-278; 1971.* (69 references)

Major publications on analysis of organophosphates both as single and multiple residues are reviewed. For multiresidue analysis high purity grade 923 silica gel and charcoal/Sea Sorb/Celite have been used successively in the clean-up process. While GC is the primary instrument of detection, confirmative procedures have utilized polarographic determination. Azinphos compounds, demeton, diazinon, dichlorvos, dimethoate, fenchlorphos (ronnel), malathion, mevinphos, and parathion are frequently analyzed individually and a number of procedures have been developed for them. The total phosphorus colorimetric procedure for demeton and related compounds has been replaced in the methods of the A.O.A.C. by a GC technique.

74-1518. Voinava, I. V.; Mil'chyna, M. G.; Syarogin, V. V'. (Belorussian Sci. Res. Inst. Sanit. Hyg., USSR). **Vyznachenne astatkavykh kol'kastsey 2,4-dykhlorfenoksivotsatnay kislaty i yaye vytvornykh u tkankakh zhyvelin. [Determination of residual amounts of 2-4-dichlorophenoxyacetic acid and its derivatives in animal tissues.]** *Vestsi Akad. Navuk Belarus. SSR Serv. Sel'skagaspad. Navuk 2: 110-112; 1973.* (4 references) (Belorussian)

A spectrophotometric method for the determination of 2,4-dichlorophenoxyacetic acid and its derivatives (amino and sodium salts as well as butyl ester) in animal tissues, blood, and urine is described. Following extraction of 2,4-D with pyridine hydrochloride at 207-210 C, the extract is further purified by repeated extraction with petroleum ether and ammonia. A 1% solution of 4-aminoantipyrine and 2% solution of potassium ferrocyanide are added for spectrophotometric determination of the optical density at 515 nm. The sensitivity of the method is 10-15 μg of 2,4-D per sample.

74-1519. Konyukhov, A. F. (All-Union Sci. Res. Inst. Exp. Vet., USSR). **Opredeleniye antio i fosfamida vo vnutrennikh organakh zhivotnykh i vode. [Determination of anthio and dimethoate in internal organs of animals and in water.]** *Veterinariya (Moscow) 1: 96-98; 1974.* (Russian)

A thin-layer chromatographic method for the qualitative and quantitative determination of anthio (formothion) and (phosphamide) (dimethoate) residues in the internal organs of animals and in water is described. Following chloroform extraction of anthio and dimethoate from organs and water the extracts are purified by reextraction with water and chloroform to remove substances which might interfere with the determination. The purified sample is transferred onto KSK silica gel or Silufol for chromatographic determination, using 9:1 ratio of chloroform and acetone as solvents. Visualization is done by means of 20% sodium hydroxide solution, and subsequently by means of ammonia-acetone solution of silver nitrate. Anthio and dimethoate appear in the form of dark gray spots against a white background, the *Rf* values being 0.73-0.8 for anthio and 0.42-0.48 for dimethoate. The sensitivity of the method is 0.2 mg/kg in the internal organs of animals and 0.05 mg/l. in water.

74-1520. Yaroshenko, V. I.; Gladenko, I. N.; Alekseyenko, F. M. (Ukrainian Sci. Res. Inst. Exp. Vet., USSR). **Ekspress-metod diagnostiki otravleniya pchel. [Rapid method for diagnosis of poisoning in bees.]** *Veterinariya (Moscow) 1: 98-99; 1974.* (Russian)

A rapid method for the diagnosis of poisoning by organophosphorus pesticides in bees is described. The enzymatic method is based upon the esterase-inhibiting property of organophosphorus pesticides. Brain homogenizate prepared from bees which had died from organophosphorus pesticides is transferred onto a sub-

strate formed by 1-naphthyl acetate. Inhibited brain esterase in poisoned bees prevents the breakdown of 1-naphthyl acetate. Consequently, the solution will remain yellow. When brain homogenizates from normal bees react with the same substrate, the solution will acquire a pink color. To obtain reliable results by this enzymatic method, the diagnosis should be performed within 15 days after poisoning.

74-1521. Truelove, B.; Davis, D. E.; Jones, L. R. (Auburn Univ. Agr. Exp. Sta., Dept. Botany and Microbiol., Auburn, AL 36830). **A new method for detecting photosynthesis inhibitors.** *Weed Sci. 22(1): 15-17; 1974.* (5 references)

A method is described in which tissue excised from cotyledons of 10-day-old pumpkin (*Cucurbita pepo* L. 'Alabama Gold') seedlings is floated in the light on a phosphate-based medium suspected of containing a photosynthesis inhibitor. The discs sink in a few hours if photosynthesis is inhibited; otherwise they continue to float. The method is capable of detecting a 0.002 to 0.02 ppm concentration of the herbicide prometryne [2,4-bis(isopropylamino)-6-(methylthio)-*s*-triazine]. The method could be used both for screening chemicals for potential herbicide use and for monitoring water for pollution by photosynthesis inhibitors. (Author abstract by permission)

74-1522. Wagner, R. (Arbeitshygienische Untersuchungsstelle fuer die Landwirtschaft, Manschnow, DDR). **Identifizierung und Bestimmung von phosphororganischen Insektiziden sowie Carbaryl auf Duennschicht-Fertigplatten. [Identification and determination of organophosphorus insecticides as well as carbaryl on thin layer ready plates.]** *Z. Gesamte Hyg. 19(7): 509-510; 1973.* (11 references) (German)

A thin-layer chromatographic method for the rapid identification and workplace concentration determination of organophosphorus insecticides and carbaryl on Silufol plates is described. Two different solvent systems (40:10:16:20:9 ratio of toluene:iso-propanol:-methanol:acetonitrile:water and 9:1 ratio of chloroform:acetone) are used for the separation of the pesticide residues. The *Rf* values determined for dimethoate, dichlorvos, methyl parathion, tinox, carbaryl, trichlorfon, and butonate in the first system are 0.57, 0.63, 0.73, 0.65, 0.46, and 0.60. The spots are visualized either by means of brilliant green with bromine vapor or enzymatically, using beef liver extract solution, UV irradiation, and ammonia spray. The esterase inhibitors appear on the plate in the form of light-colored spots against a pink to bluish-red background. The limits of qualitative detectability of dimethoate, dichlorvos, methyl parathion, tinox, carbaryl and butonate by means of the brilliant green-bromine vapor procedure are 0.2, 10, 0.5, 2, 0.5, and 10 μg. The corresponding values obtained for the enzymatic visualization are 20, 0.5, 0.1, 50, 0.2, and 2 ng.

74-1523. Novikova, K. F. (Author address not given). **Opredeleniye ostatochnykh kolichestv khlor- i fosfororganicheskikh pestitsidov v produktakh pitaniya, pochvi i vode. [Quantitative assay of organochlorine and organophosphate pesticide residues in food products, soil, and water.]** *Zh. Vses. Khim. Obshchest. 18(5): 562-570; 1973.* (209 references) (Russian)

Methods available for the extraction, purification, and quantitative determination of organochlorine and organophosphate pesticides in food products, soil, and water are reviewed, and procedures for the determination of specific pesticides are proposed. Acetonitrile, hexane, chloroform, and benzene are among the commonest solvents used for the extraction of pesticides from different media. The extracts can be purified, apart from by the conventional methods, by vacuum sublimation, column chromatography, and codistillation in nitrogen flow. Thin-layer chromatography, gas-liquid chromatography with flame-photometric or microcoulometric detector, and polarography are among the advanced methods in pesticide residue analysis. Polarographic and chromatopolarographic methods for the determination of hexachlorane (BHC) in plant materials have been developed. A new colorimetric method for the determination of heptachlor is based on the reaction of heptachlor or its epoxide with ethanolamine and potassium hydroxide in butyl cellosolve. A colorimetric method for the determination of polychloropinene and polychlorocamphene (toxaphene) exploits the reaction of the pesticides with diphenylamine in the presence of chlorine. Spectrophotometric method for the determination of hexachlorobutadiene in wine, soil, and water has been developed. Trichlorometaphos-3 (ronnel) is determined by gas-liquid chromatography, as is phosalone in soil, vegetables, and fruits, and dimethoate and malathion in fruits and vegetables. A new colorimetric method for the determination of trichlorfon is based on the reaction of trichlorfon with pyridine in alkaline medium following hydrolysis to chlorform.

See also **74-1284** **74-1298** **74-1312** **74-1362** **74-1466**

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

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